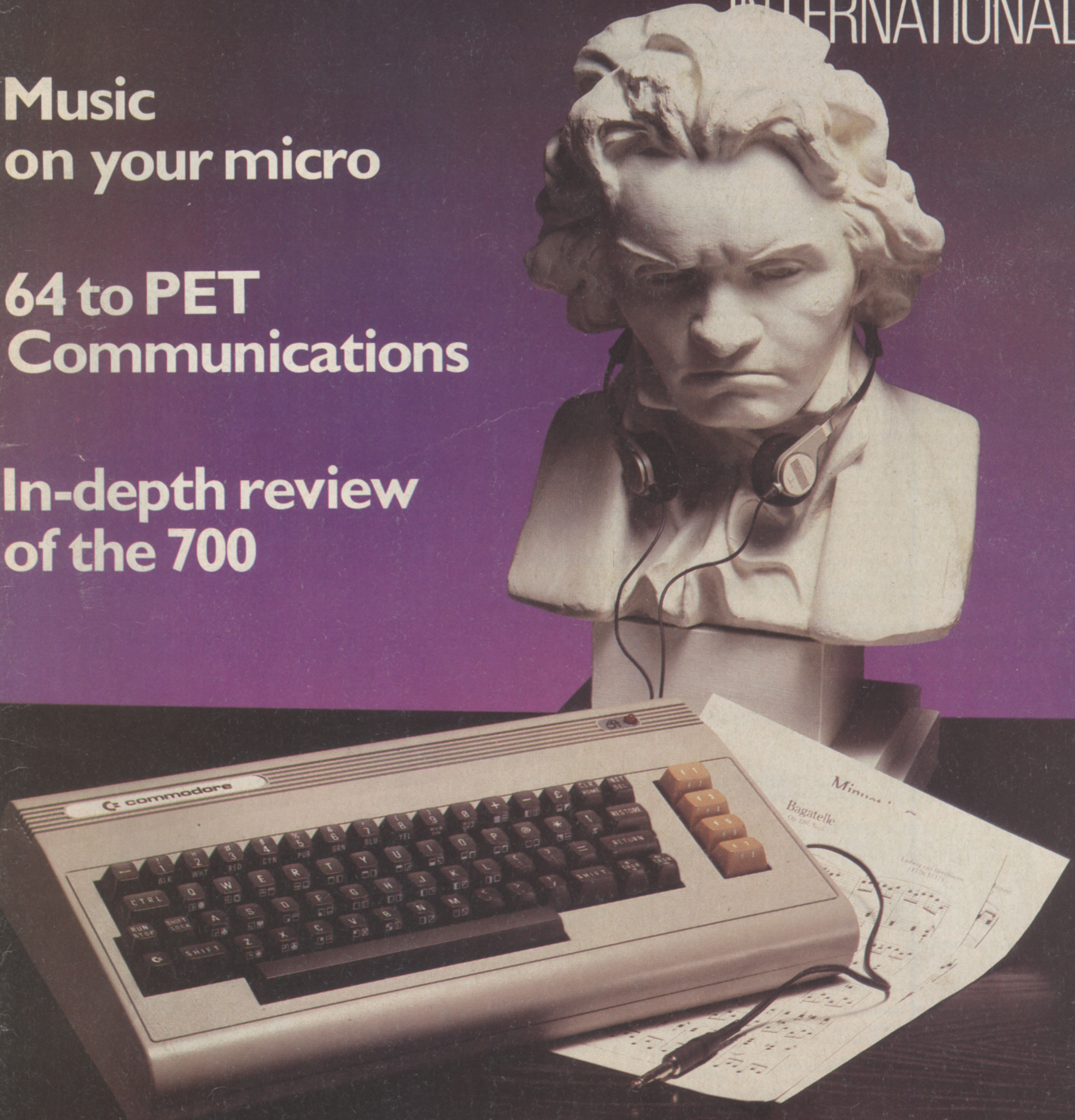
commodore COMPUTING INTERNATIONAL

Vol 2 No 5 £1
SEPTEMBER 83

Music on your micro

64 to PET Communications

In-depth review of the 700


commodore
Minuet
Bagatelle

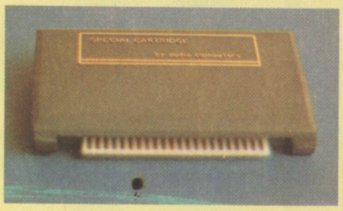
The independent magazine for all Commodore computer users

USA $3.50 CANADA $3.50 GERMANY 6DM FRANCE Fr18.5 AUSTRALIA $3.00
70151

FROM AUDIO-COMPUTERS (SOLIDISK) THIS MONTH:

NEW LOW PRICES ON VIC-20 HARDWARE ADD-ONS AND THE INTRODUCTION OF NEW SOFTWARE CARTRIDGES

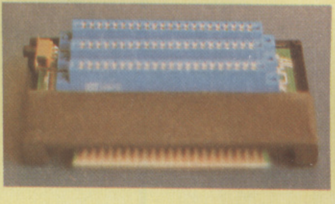
If you have already bought a memory cartridge for your VIC-20 computer, we still have many exciting items to offer, under the heading 'FURTHER EXPANSION'. They are perfectly compatible with all Commodore and many other manufacturers products.



NEW LOW PRICE ON 16K MEMORY CARTRIDGE:

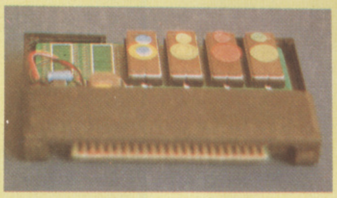
Any program sold for the VIC-20 with 8k or 16k extra memory will run with the SRC16.
The NEW PRICE of the SRC16 is now only £27.00, including VAT and manual.
It is important to know what else you can do with the SRC16 other than running big programs.
1) The SRC16 can be upgraded to 32k bytes of RAM at a fraction of the cost of a 16k cartridge. This upgrade costs only £11.00
2) The SRC16 has an X-ROM SOCKET. Games or utilities ROMs such as SCREEN ROM or SOUND ROM can be bought separately and used in this socket. Each software ROM costs around £5-10.00.
3) The SCR16 can have an EXPANSION SLOT built in. This important fact should be noted, since many VIC users experience fitting problems and extra expense when adding a Programmer's AID toolkit cartridge or the Machine Code Monitor Cartridge to their system. With many other low cost 16k memory cartridges, the user will have to buy a multi slot motherboard just to accommodate any extra cartridges. This feature alone could save you as much as £20! The SLOT is the exact reproduction of the expansion port into which the SRC16 is inserted and will cost you only £3.00. Right now you can choose any of the extra features to be built into your SRC16 cartridge. Simply tick the option boxes shown.

FURTHER EXPANSION TO THE VIC-20 COMPUTER:



1) 3 SLOT MOTHERBOARD:

for those for whom it's too late to buy a SRC16 cartridge or who want more than just memory. The 3 Slot MOTHERBOARD is not without special interest:
a) A Memory Select System allows the user to add the memory capacity of 2 RAM cartridges — for example, an SRC16 and a Commodore VIC-1111 can be used together to provide 32k bytes.
b) An optional 8k Memory System, very flexible, that will give 11775 bytes free or 6655 bytes free in the Low Res area or occasionally 8k bytes at $A000 to $BFFF for developing your own Autostart program can be added. Furthermore, if you then add your SRC16, you will get 28159 bytes free for your VIC 20!
c) 2 EPROM SOCKETS: this feature is very much appreciated by most users and has been added only very recently. You can use either 4k EPROMs (2732) or 8k EPROMs (2764) in these sockets. Each EPROM can be activated individually exactly as if you had 2 extra cartridges in your system!

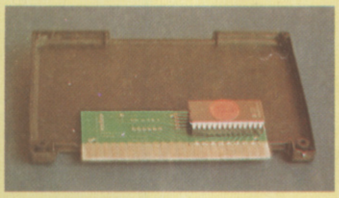


2) THE VIC EPROM PROGRAMMER: (uses 2764 Eproms)

We would need a whole page to describe this exciting peripheral for your VIC-20. Briefly, the cartridge works a little like a Disk. You can insert the VIC EPROM PROGRAMMER (VEP for short) into the SLOT and activate it with:
SYS 39000
On the VEP, you will find 4 EPROM sockets. Now type in 'C' to display the catalog. It will show what is in every EPROM. It could be like this:

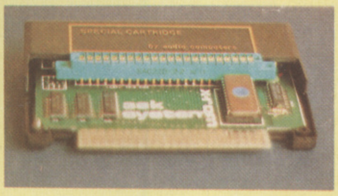
```
1. BIGBASIC          Simply enter 'R.1' to read the first program. You will instantly see:
2. UTILITY           *READING BIGBASIC
3. AUTOSTART GAME    *READING OK
4. BLANK EPROM       READY
```

Now you can list it, print it, run it etc. . .
The VEP does the loading of a 16k program in about 3 seconds with no loading error unless you have a bad RAM; it will then list out all the dead or missing bytes!
To put a program into EPROM, load it from tape or disk, activate the VEP and enter 'W PROGRAM-NAME' — very simple to do. Other useful commands provided by the VEP include Hex Memory Display, Memory Change, Memory Fill, Memory Transfer, Save a Block of Memory, Load Tape, Cold Start, Centronics Printer Drivers etc. . .
You can put Basic, utility or autostart games onto Eprom in a similar way. The VEP will work out where your program is stored and will scan the EPROMs to find enough space to put it.
You can also use it as a self contained Eprom programmer to program, verify and copy Eproms.
Utility and Autostart EPROMs made with the VEP can be used on our Motherboard or on our BLANK SOFTWARE CARTRIDGES and used as any software cartridges.
We supply a small manual together with the VEP showing how you can write an Autostart program, in Basic and in machine code. We will also supply you with a free Blank EPROM and a free Blank Software Cartridge to get you started.
A word of warning: we have developed this equipment to help users in materialising sellable software (we are very keen to buy) and will disclaim any illegal use of it.



SOFTWARE CARTRIDGES

(insert directly into back of VIC, into Motherboard or SRC slot).
1) SCREEN CARTRIDGE: Sets the screen size within limits as small or large as you like. You can for example set the screen to 40 lines × 80 columns and a 'window' of 25 lines × 30 columns, write a letter or draw a colourful playing board and move your window with control keys or joystick. As you are typing in, the window will move along to accommodate. Basic programs can be typed in, listed and run even in 80 column format. Price £10.00.
2) SOUND CARTRIDGE: transforms your VIC into an electric organ. You can play music with the keyboard, add a second voice when it plays the 1st, a 3rd when it plays back the 1st and 2nd etc, define ENVELOPE to create effects like wailing police siren, play music within basic program without slowing the speed of Basic. In short, the sound Rom makes the VIC as tuneful as the BBC micro or the ATARI. Price: £10.00
These 2 cartridges are also available in chip form. You can use the chips in the Motherboard or in the X-ROM socket of your SRC16. Price: £8.00 for either of the 2.
3) MORE CARTRIDGES will be released. We would like to market your programs in cartridge form. Alternatively, we can supply blank cartridges at very competitive prices for commercial use. We are just a phone call away so if you have a good idea, why not give us a ring?



SUMMARY	PRICE/U INCL. VAT
SRC16	£27.00
OPTIONAL EXTRAS FOR THE SRC16:*	
UPGRADE TO 32K	£11.00
EXPANSION SLOT:	£3.00
FURTHER EXPANSION:	
3 SLOT MOTHERBOARD:	£19.95
OPTIONAL EXTRA 8K FOR MOTHERBD*	£16.00
VIC EPROM PROGRAMMER (+ free gift)	£39.00
EXTRA 2764 BLANK EPROM:	£6.00
BLANK SOFTWARE CARTRIDGE:	£3.00
SOFTWARE CARTRIDGES:	
SCREEN CARTRIDGE:	£10.00
SCREEN ROM ONLY:	£8.00
SOUND EFFECT CARTRIDGE:	£10.00
SOUND EFFECT ROM only:	£8.00
Post and packing:	£1.00
TOTAL:	

*I enclose a cheque/postal order payable to SOLIDISK LTD for £:
*Please charge my Access/Barclay credit card account No:
(*Please delete/complete as applicable)

. . . .

Signature

Name: Mr/Mrs/Miss: . . . .

Address: . . . .
. . . .
. . . .

Please note: optional extras cannot be purchased alone. Also, if you wish to purchase them at a later date, SRCs and Motherboards must be returned together with the appropriate payment + £1 P+P. We regret we cannot accept orders of less than £10.00. All prices include VAT at 15%. Europe: deduct VAT, add £3.

Official UK dealers:
SUMLOCK, Manchester, Norman DAVIS, Mill Hill, GODFREY'S, Basildon, CURRY'S MICROSYSTEM chain store.

Official European distributors:
Benelux: ECD, Delft Tel 015 134429.
France: RUN informatique sarl, Paris Tel (01) 581 5144.
Germany: VOBIS Data computer GMBH, Aachen Tel (0241) 50 00 81.
SCHAEFER, Roetgen Tel (0240) 88 319.
Italy: SOLIDISK Italia, Inglesias (CA), Tel 0781 22529.
Portugal: LANDREY Engineering, Lisboa Tel 681243.
Sweden and Norway: DIGILOG, Goteborg Tel 031 20 29 00.

Thank you for the interest shown. Marketing Manager: H. PERRY

TO: SOLIDISK TECHNOLOGY LIMITED
(T/A AUDIO COMPUTERS)
87 BOURNEMOUTH PARK ROAD
SOUTHEND ON SEA
ESSEX SS2 5JJ UK

OUR TELEPHONE NUMBER:
CREDIT CARD SALES/
DEALER ENQUIRIES:
0702 618144

ENQUIRIES:
0702 613081

commodore COMPUTING INTERNATIONAL

SEPTEMBER 1983

Managing Editor
Nick Hampshire

Staff Writer
Martin Bush: tel 01-636 6531

Programmers
Richard Franklin

Advertisement Manager
Peter Chandler: tel 01-636 6408

Subscriptions Manager
Deidree Hammond-Parker
tel 01-636 6354

Art Directors
Paul Clarkson
Malcolm Allen

Production Manager
Richard Povey

Distributed by Magnum
Distribution Ltd, Chronicle
House, 72-78 Fleet Street,
London EC4Y 1HY.

Commodore Computing
International is not in any way
connected with Commodore
Business Machines UK Ltd.
It is published monthly by Nick
Hampshire Publications,
167-169 Great Portland Street,
London W1.

PRINTED BY AMBASSADOR PRESS. ST. ALBANS. HERTS

NEWS AND NEW PRODUCTS ____ 4
A survey of the latest new products for Commodore machines.

APPLICATION STORY ____ 14
Micro computers for architects and surveyors.

MUSIC ON YOUR MICRO ____ 16
How to synthesize waveforms for superior music with up to seven voices.

SOFTWARE REVIEW ____ 28
'64 Assembler' and 'Superscreen' for VIC.

GAMES REVIEW ____ 34
'High Flyer' – 'Telengard' – 'Monopoly' and more.

EDUCATION ____ 38
History of computing.

BOOK REVIEW ____ 41
'Illustrating Basic' and 'Learning to Use Your 64 Computer'.

CASSETTE USER ____ 43
Inside the VIC cassette deck.

HINTS AND TIPS ____ 47
Computed jumps on the 64 – Alternative variable sets – PET, 64 and VIC conversion chart.

DEALER DIRECTORY ____ 54
Where to find Commodore products and machines.

HARDWARE REVIEW ____ 61
An in-depth review of the 700 and the products for it.

INTERFACING ____ 68
Correcting PETs to 64s and VICs via the user port – the first part of a new series.

INSIDE BASIC ____ 73
How a BASIC program is stored in memory.

BASIC PROGRAMMING ____ 77
'Starfleet Command' – 'Moon Lander' and quarter square graphics for graph plotting.

MACHINE CODE PROGRAMMING ____ 93
Hi-res dumps from the 64 to an EPSON printer.

NEWS

NEW PRODUCTS

Dusting off with Gas

More computer maintenance, this time from a company called Pelling and Cross Limited who produce a cleaning system called Dust-Off II. The difference here is that this is not a cleaning solution but a pressurised gas in a can with a trigger valve and a couple of extension nozzles. This enables the user to control the jet of air and remove particles of dust although obviously it will not remove things like coffee stains. The makers say that the advantage it does have is that it is a form of removing dust without leaving the static left behind by wiping, and it can also be used for the keyboard, disc drives, read/write heads and print mechanisms.

This, say the manufacturers, is preventative maintenance for the modern office.

FALCON
Dust-Off II
The Advanced Cleaning System

For a 12oz canister the cost is £20.71 without VAT and a refill will cost you £2.83. Should you make use of their mail service then the prices are £25.54 and £4.98 respectively.

Area: *Maintenance*
Company: *Pelling and Cross Limited*
Address: *Unit 10/11 Wooburn Industrial Park, Bourne End, Bucks. HP10 0PF.*
Telephone: *06285 28121*

Petspeed Goes 700

First of all there was Petspeed and then there was Petspeed 64 which was purchased outright by Commodore because it was so good. The latest in the line of the Petspeed family is Petspeed 700. As every fan of Oxford Computer Systems should know, this is a Basic compiler designed to ensure the smooth running of a piece of professional software and increasing the actual speed of the program, in this case up to a factor of 40. How does it do this? Simply by breaking the program down into sections whilst the program is being compiled and getting rid of all the unnecessary statements and simplifying all the complex routines.

Area: *Compilers*
Company: *Oxford Computer Systems*
Address: *Hensington Road, Woodstock, Oxford OX7 1JR*
Telephone: *0993 812700*

Speeding up with interfaces

There is a new range of printer interface buffers available from Interface Systems which should ensure that although your printer is too slow for your machine the printed output is speeded up without affecting the quality. This device is positioned between the computer and the printer and it will accept characters at a rate in excess of 10,000 per second and stores them for transmission to the printer when it is able to accept them. The buffers have a storage size of either 16K or 48K and the necessary connecting interface cables can be either Centronics, RS232 or IEEE.

Area: *Buffers*
Company: *Interface Systems*
Address: *Trenton House, 16 Eversley Road, Bexhill-on-Sea, Sussex TN40 1HA*
Telephone: *0424 225656*

VIC gets the Rabbit

Currently available in America is something called the VIC Rabbit which comes either on a cartridge for the VIC or on a ROM for the PET/CBM. This software package adds 12 commands that allow you to verify a program, perform conversions, GOTO monitor or machine language program, save, load and run and kill the rabbit. To load or save an 8K program, Rabbit takes about 32 seconds which is quite a considerable amount of time less than loading from a VIC or PET cassette deck.

On the VIC, the Rabbit is just inserted into the cartridge slot. The cartridge contains an expansion connector so that additional memory and cartridges etc can be plugged in at the same time. For the 2001, 4001 and 8032 the ROM plugs into a spare socket inside the computer.

Area: *Programming aid*
Company: *Eastern House Software*
Address: *3239 Linda Drive, Winston-Salem, Northern Carolina 27106, United States of America*
Telephone: *USA 919 924 2889/ 748 8446*

Plan-kit sidekick

BHRA are now offering a resources module to accompany the project control and forward planning program called Plan-kit. To refresh your memory, Plan-kit, produced by BHRA's Technical Software Centre, can handle over 500 activities and give you the earliest and latest start and finish dates for each project. You can also take into account events like holidays which affect the progress of the project, print out lists of activities, departmental responsibilities, graphs etc. Plan-kit runs on the 4000 and 8000 series with twin disk drives, 3022/4022 and 8023 printers.

The resources module enables the user to check that all the necessary ingredients for the project are actually available and also allows for cash expenses to be checked against the projected income at any stage. There is also the possibility of allocating up to 40 resource centres which can act independently of each other. Such a centre can be analysed individually, with other centres or with the complete list of centres and any activity can have 9 resource centres. All the output comes either in the form of a histogram which is cross-related to the bar chart or in the form of a table.

Plan-kit costs £250 and the resources module costs £250. If the two are bought together, the cost is £450.

Area: *Project planning*
Company: *BHRA Fluid Engineering*
Address: *Technical Software Centre, Cranfield, Bedford MMK43 0AJ*
Telephone: *0234 750102*

Cleaning anti-glare screens

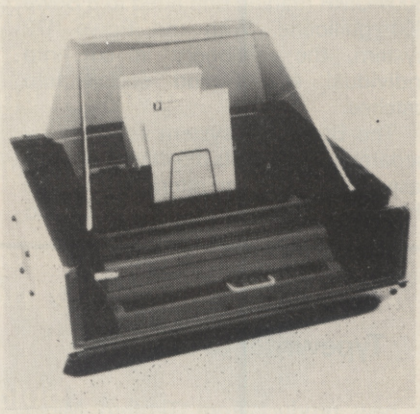
Since somebody came up with the bright idea of producing anti-glare screens, somebody has decided that these screens provide a new market for yet another cleaning solution. This particular solution is from Inmac and is called the Glare Sentry Cleaning Solution which should remove dust, fingerprints, grime etc from the glare screen as well as the VDU screen without causing any damage. Each container has 300ml of solution and costs £3.50 each including cleaning swabs.

Inmac have also come up with a series of other goodies including a wristrest which is supposed to eliminate wrist fatigue. This rest comes in the form of a moulded polymer bar which is adjustable to a height of 45mm and will set you back £15. And now, to hold the text you are typing in, comes a copyholder which is rather like an Anglepoise lamp in design. The actual copyholder can be adjusted according to reading level and work height, the copy being held by spring clips. Unlike other copyholders, the holder is attached to the copy by means of a small clamp and a line cursor which moves down each time a foot pedal is depressed.

They have also come up with their own printing service called Streamprint which guarantees delivery of printed stationery within 5 working days. There is a selection of typefaces available and company logos can be accounted for.

Finally, they have recently announced their range of acoustic covers called the Hushcover which is supposed to be able to reduce the noise from a printer from 64 decibels to 50 decibels depending on the type of printer. It was designed by Inmac in conjunction with ICI Acoustics and to prevent it from overheating if the fan stops, the printer cuts out altogether. The cabinet housing is made out of steel and mineral wool to absorb the noise and vibrations. The lid is made out of perspex. There are three types of cover available, the one that applies to the Commodore 4022 and similar tractor feed printers being the HC222 which costs £355 pounds. All of Inmac's products are available on a 30 day trial period and have a guarantee for one year.

Area: *Home accessories*
Company: *Inmac (UK) Limited*
Address: *Davy Road,*
Astmoor, Runcorn,
Cheshire WA7 1PZ.
Telephone: *09285 67551*



Printing and plotting

Coming from Gould Bryans Instruments Limited is the Computagraph Colorwriter of which there are two models. The difference between the two is the fact that the ISO A3 model has 10 pens and the ISO A4 model has 7 pens. Either model can be connected to the micro via an RS232C or IEEE interface.

The Colorwriter has a standard buffer memory capacity of 2K which is expandable to 16K. It has a printing speed of five characters per second and a writing speed of 40cm per second which is user selectable in increments of 1cm per second.

Amongst its routines are the plotting of bar charts, pie charts, arcs and circles plus many more. However, if you are in the middle of plotting something and you need to pause, all you have to do is press the pause on the front panel of the plotter or by software instruction. Should you need to go into the digitise mode the pen can be positioned anywhere and the coordinates transmitted to the computer.

The price of the A3 model is £1,995 and the price of the A4 model is £1,595. These prices do not include the interfaces or VAT.

Area: *Plotters*
Company: *Gould Bryan*
Instruments Limited
Address: *Willow Lane,*
Mitcham, Surrey
CR4 4UL
Telephone: *01 640 3490*

Catering IMI style

IMI Computing have cooked up something which should be of interest to any chef or catering manager. This is a user friendly, fully interactive system called The Catering Manager which operates on an 8032 with an 8050 disk drive and any suitably interfaced printer. It acts as a stock control and recipe costing system which has been specifically designed with industrial and canteen establishments in mind. All the categories are defined by the user, with a maximum of 2000 stock items and 1500 recipes that can be held in 30 categories. Each recipe can hold a maximum of 18 ingredients. This, of course, is not all of the system's features. Any manager wants to keep an accurate record of stock levels and movements and this need is satisfied with stock lists that show the latest stock position, weekly and monthly reports giving the stock movements over a period with auditory totals and a printed audit trail of stock movements. Should you want to update stock this is pretty easy as well. Because it is an integrated system, any change in price automatically updates the profit margin and the VAT payable and it is thus possible to analyse any change in the cost of an ingredient with regard to recipe costs and the cost of the meal to the consumer.

There are also 3 print options. You can print all recipes within a category, selected recipes and recipes containing a specific ingredient and each printout includes the portion cost, wastage, profit, VAT and the final portion selling price.

Area: *Stock control*
Company: *IMI Computing*
Limited
Address: *PO Box 166, Haigh*
Park Road, Stourton,
Leeds LS1 1RD
Telephone: *0532 715850*

Separating Stationery

Alacra Limited, the UK supplier of the Bowe equipment for computer form handling, has released three new systems for batch separation of computer stationery.

It is often desirable to have the output separated into batches, eg by area or customer. This can be accomplished using Optical Mark Recognition techniques. The printer prints a character at the end of each batch of sheets to be separated which is detected by a Bowe 8004 OMR reading unit fitted to a Bowe 304 guillotine. With the Bowe 172 system, the stationery is cut into individual sheets and sorted into batches.

The Bowe 161 system operates by separating out sheets directly on line to a laser printer using an interface unit. The third system is called the Refold Unit and this system cuts the stationery at the end of the batches as denoted by the OMR marks. Alacra claims that the average output is 6,500 separated forms per hour.

Area:	*Stationery*
Company:	*Alacra Limited*
Address:	*Iveagh Avenue,* *North Circular Road,* *London NW10 7UJ*
Telephone:	*01 965 9311*

Bi-directional interfaces

Interfaces are coming on to the market from many different firms and Small Systems Engineering Limited are no exception. They now have the B300 IEEE 488 interface which is bi-directional and replaces the SSE type B and B200 interfaces even though it is fully compatible with both of these earlier units in that it incorporates the software selectable and switch selectable baud rate control which can be 110, 300, 1200 and 9600, although the software selectable option has 16 baud rates from 50 to 19,200. This compatibility has been achieved by the fact that the latest model has been designed around the 8748 chip which provides a 40 character input buffer.

The interface is housed in a small instrument case with integral power supplies and on the front panel there are indicator lights for ON, LISTEN and TALK. Each unit also comes with a 90 day warranty against defective workmanship or component failure under normal operating conditions.

Area:	*Interfaces*
Company:	*Small Systems* *Engineering Limited*
Address:	*2/4 Canfield Place,* *London NW6 3BT*
Telephone:	*01 328 7145*

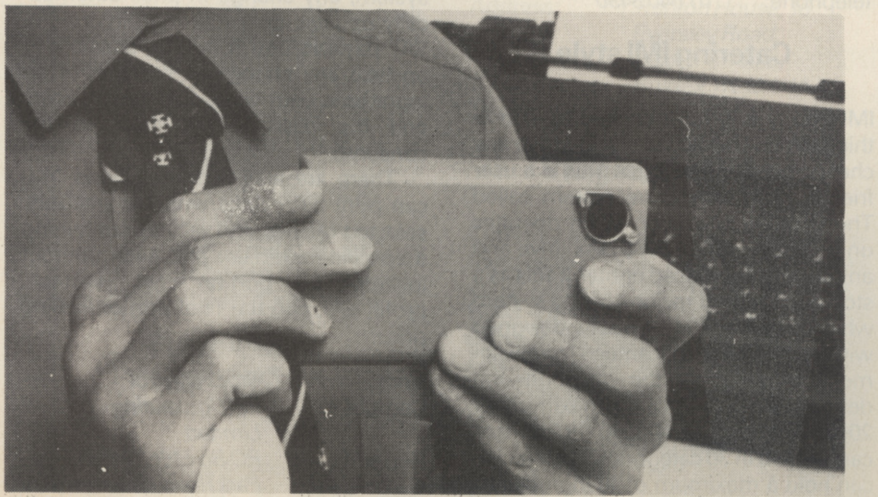
Connecting the Typewriter to the micro

A new product from Timtom Micro should be of interest to those people who, for some reason have got a typewriter and a computer but as yet do not have any means of connecting the two.

The product is of course an interface designed with the VIC 20 in mind but it could be applied to any other machine which has an RS232C/423 port operating at 300 baud.

On the typewriter side, the machine the manufacturers had in mind was the Olivetti Praxis 30 or 35 daisywheel and to this end the interface features a processor which allows users to print the complete Praxis character set. The cost of connecting your micro to a Praxis using this interface is £69.

Area:	*Interfacing*
Company:	*Timtom Micro*
Address:	*9 Ilton Road,* *Penylan, Cardiff CF2* *5DU.*



Safe Disks

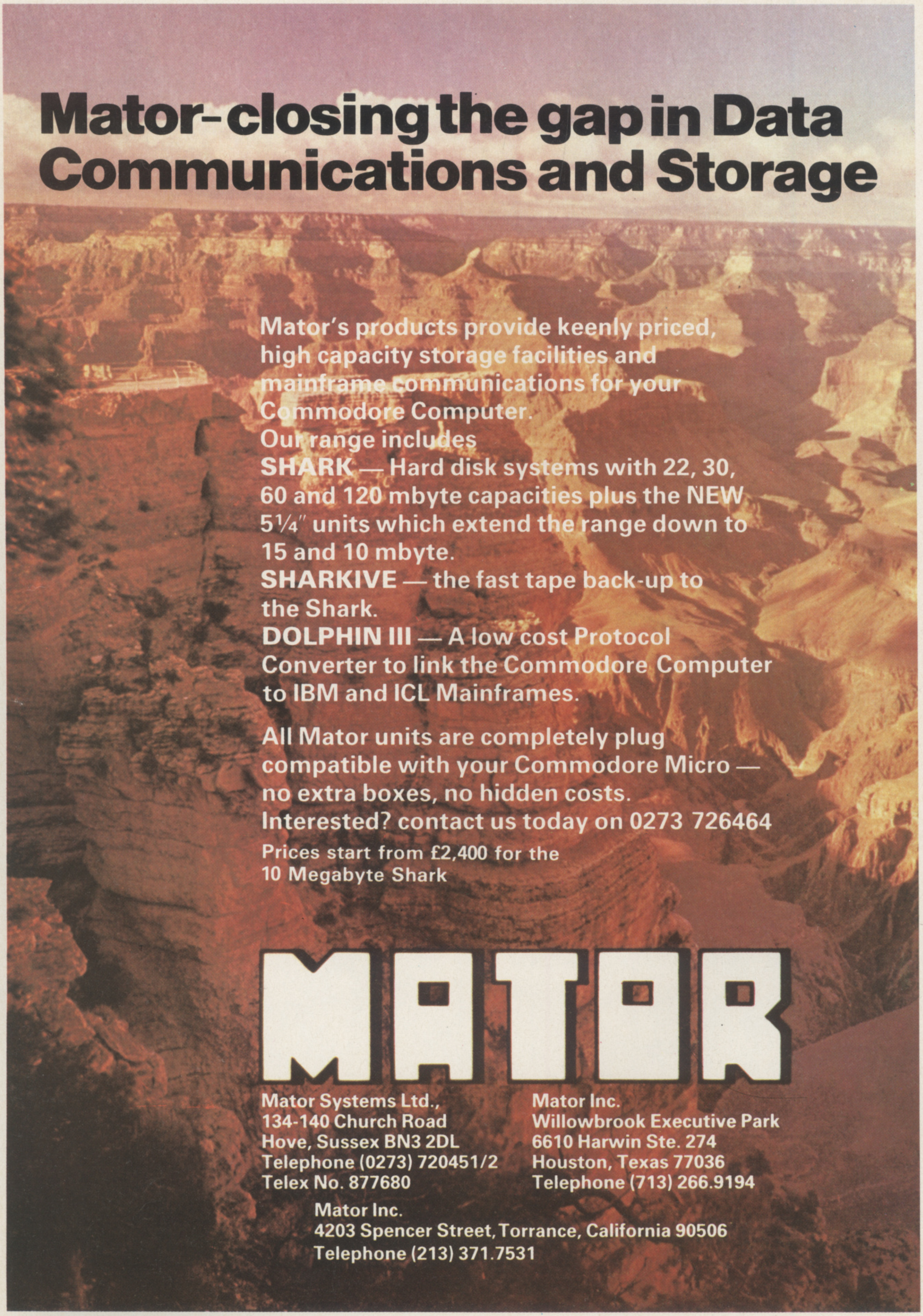
The Data Security Company are concerned that too many companies are in danger of destroying data held on floppy disks by fire. In fact, they are so concerned that they have introduced two fire safes designed specifically to protect diskettes.

The safes are made in West Germany. The diskette safe Model 20 has been designed as a piece of office furniture and thus combines the two advantages of having data ready to hand and stored in a safe location. This model costs £895 and has a capacity of 130 8″ diskettes or 390 5¼″ diskettes.

Model 21 is a free standing unit for the larger user. This safe can hold 720 diskettes in 6 pull out cages. It is priced at £1350.

Both safes have withstood temperatures of 1000°C as specified by the German Manufacturing Industry Board.

Area:	*Security*
Company:	*Data Security* *Company*
Address:	*Unit 6, Old Mill Road,* *Portishead, Bristol* *BS20 9BX*
Telephone:	*0272 849730*



Mator- closing the gap in Data Communications and Storage

Mator's products provide keenly priced, high capacity storage facilities and mainframe communications for your Commodore Computer.

Our range includes

SHARK — Hard disk systems with 22, 30, 60 and 120 mbyte capacities plus the NEW 5¼″ units which extend the range down to 15 and 10 mbyte.

SHARKIVE — the fast tape back-up to the Shark.

DOLPHIN III — A low cost Protocol Converter to link the Commodore Computer to IBM and ICL Mainframes.

All Mator units are completely plug compatible with your Commodore Micro — no extra boxes, no hidden costs.

Interested? contact us today on 0273 726464

Prices start from £2,400 for the 10 Megabyte Shark

MATOR

Mator Systems Ltd.,
134-140 Church Road
Hove, Sussex BN3 2DL
Telephone (0273) 720451/2
Telex No. 877680

Mator Inc.
Willowbrook Executive Park
6610 Harwin Ste. 274
Houston, Texas 77036
Telephone (713) 266.9194

Mator Inc.
4203 Spencer Street, Torrance, California 90506
Telephone (213) 371.7531

TRY FIGHTING THESE WITH YOU

UR BARE HANDS.

Slot "Mutant Herd" into your VIC 20 computer and all of a sudden plutonium-crazed mutants will try to eat you alive.

Keep a look-out for falling boulders. They'll crush you to death at any second.

Avoid these successfully and all you have to do is save the world by destroying the heavily guarded Mutants eggs.

"Orc Attack" (on ATARI 400/800/1200) isn't exactly childsplay either.

Imagine yourself standing on the battlements of a castle, defending your Kingdom against an army of ferocious Orcs.

Watch out for the hail of deadly crossbow bolts. You've only got two lives to lose.

And you've only got a few rocks, a sword and boiling oil to defend yourself.

Lose your head and you'll be decapitated.

If your hands aren't sweating after that try our other action packed titles.

There's "Fourth Encounter" (on VIC 20), an exciting new game with 3 skill levels.

The challenging "River Rescue" and "Music Composer" are also on VIC 20.

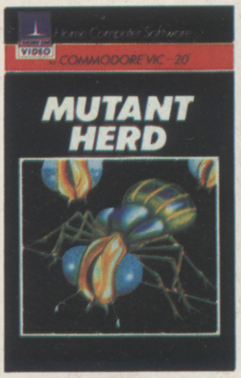
And to make the blood rush to your head the successful "Submarine Commander" is now available on VIC 20.

Or, if you've got ATARI 400/800/1200, there's the anxiety provoking "Jumbo Jet Pilot," as well as the best selling "Submarine Commander," "River Rescue" and "Kickback," all in the shops now.

Buy any one of THORN EMI Computer games and you'll have to fight off all your friends to use it.

THORN EMI
VIDEO

The world's greatest computer games.


COMMODORE VIC-20
MUTANT HERD

VIC 20

ATARI 400/800/1200
ORC ATTACK

ATARI 400/800/1200

COMMODORE VIC-20
FOURTH ENCOUNTER

VIC 20

ATARI 400/800/1200
RIVER RESCUE

VIC 20/ATARI 400/800/1200

SUBMARINE COMMANDER

VIC 20/ATARI 400/800/1200

VIC MUSIC COMPOSER

VIC 20

ATARI 400/800/1200

JUMBO JET PILOT

ATARI 400/800/1200

PROGRAMS FOR ATARI 400/800/1200 (Trademark of Atari Inc. except where indicated).
*PROGRAMS FOR COMMODORE VIC 20 (Trademark of Commodore Electronics Ltd.).

NEW!

KAYDE

New adventure series for the:– ORIC 48K, SPECTRUM 48K, DRAGON 32, COMMODORE 64 and NEWBRAIN Computers £9.95 each

THE ROUNDSBY INCIDENT

In your time you have done many things for many people. Your blade has seen the service of more than one nation, and been the downfall of many brave opponents.
Now you are in the service of Rambol the Merchant.
Will you be able to discover Roundsby's secret?

ACE IN THE H.O.L.E.

The H.O.L.E. is the code name for the Humane Orbital Legislation Enforcer. It is little more than a place of termination.
Ace Brannigan, you are about to face the hazards of the H.O.L.E.
Can you survive long enough to reach the shuttle - craft and freedom?
Will you trigger one of the deadly devices that are set to bring about your demise?

TERROR FROM THE DEEP

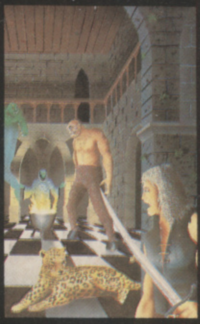
At 4.30 on August 18th 1864 a storm hit your ship. Within minutes it had been consigned to the deep. You somehow managed to leap clear of the doomed ship and cling to some floating debris.
Can you find the means to rid the world of this terror from the deep?

HORROR ATOLL

The day seemed to be absolutely perfect. The two of us floating happily along in our balloon. Not a single cloud in sight. I suppose it lulled us into a false sense of security.
The storm blew up from nowhere and before we knew it, we were fighting for our lives. There was nowhere to land, just the sea below us.
What is the object you can see on the rock in the middle of the lagoon?

ARCANE QUEST

In his job, Colin Grasmere has investigated many strange and baffling phenomena. Hauntings visions, flying saucers, poltergeists, to name but a few. Colin Grasmere is a psychic investigator. Dare you face the beastly one with nothing but a cross and a heart full of purity?



LEOPARD LORD

The first in the new range.
Can you rescue your friend from the elite Leopard Lord - Fordel? You will need to destroy the evil wizard! Scenes are set in and around a castle.

THE SWAMP

Death stalks the swamp at every turn. Nowhere is safe and you're on your own. You survive on your wits alone with nobody to help you. You'll gasp with relief when you come to the end of the struggle against some of the most dangerous monsters ever programmed. You can be a wizard, thinker, barbarian, warrior of cleric. But you've got to be good No silly problems to hinder your progress. It's just you against the Swamp.
Commodore VIC 20, Dragon 32, Newbrain, Oric 48 and 48K Spectrum.
£9.95

PICNIC ADVENTURE

PICNIC ADVENTURE

An Alice in Wonderland type adventure game for youngsters. You'll meet magical characters like the rabbit and the mouse, travel along coloured roads, collect everyday objects that may have an unusual use. And you wake-up you'll find yourself back at the Picnic.
£7.95

New 16K Spectrum Arcade Games.

- FISHERMAN FRED
- E x T
- PENGUIN
- SEA BATTLE
- COSMONOIDS

£6.95 each.

Mail Order + Showroom
Kayde Software Ltd
The Conge Great Yarmouth
Norfolk NR30 1PJ Tel: (0493) 55253/57867 Telex 975535 Kayde G

New London Showroom
Kayde Home Computers Ltd
1 Station Approach
New Eltham London SE9 Tel: 01-859 7505

ALL MAIL ORDERS
TO: KAYDE SOFTWARE LTD,
DEPT. cc9 THE CONGE, GREAT YARMOUTH,
NORFOLK NR30 1PJ

PLEASE PRINT AND STATE TYPE OF COMPUTER

Qty.	Item	Item Price £	Total £

Please add 50p p + p.

BARCLAYCARD VISA

DON'T FORGET YOU CAN ALWAYS ORDER ON THE TELEPHONE WITH YOUR CREDIT CARD. DEALERS WELCOME.

*I enclose a cheque/postal order payable to **KAYDE SOFTWARE LTD**, for

£............ *Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable.

Signature

Name: Mr/Mrs/Miss

Address

Telesoftware for the Pet and 8000

A company called O E Limited have come up with a package for the 3000, 4000 and 8000 series machines. This is their telesoftware terminal which operates in conjunction with a V23/RS232 acoustic or direct connect modem, a serial interface unit and software to support Viewdata or any similar information system.

As well as transforming the CBM into a Viewdata terminal, the user can also load telesoftware programs direct from a central database system via the telephone line. To obtain this facility, all the user has to do is dial the number of the Viewdata computer and the information is displayed on the screen.

Once a program has been downloaded, the user may SAVE, RUN and LIST it. The alpha keyboard acts as a terminal to allow you to leave messages with the Prestel/Viewdata Mailbox as well as filling in the Teleshopping response frames which may or may not be stored on disk so that each time you want to view a page you do not have to keep telephoning the central database and adding to your 'phone bill.

The whole system could cost the earth, but at only £185 plus VAT it sounds like a bargain. There is one problem. According to OEL's sales manager, George Rayner, they are looking out for dealers to handle this equipment.

Area: *Communications*
Company: *O E Limited*
Address: *Industrial Estate,*
Appleby,
Westmorland,
Cumbria CA16 6HX
Telephone: *0930 51909*

Virgin Launch

Virgin Computer Games' hunger for computer programmers seems to have been satisfied with the recent appointment of eight programmers out of the 500 games that were originally sent in.

All of the final eight games which includes a game called Mission Mercury for the unexpanded VIC 20 have officially been launched with the promise of more to follow, hopefully 30 titles by the end of the year. Each of the cassette based games will feature one side of music with the appropriate game in mind as well as a form to enable the user to join the Virgin Games Gang.

Mission Mercury is priced at £7.95 and the aim of the game is to rescue the scientists left on Mercury, a planet devastated by radiation. A joystick is essential if you want to avoid the asteroids and land the ship safely. Appearing on the screen is the score, fuel level, the number of successful rescues, the number of lives you have left and the highest score. This all sounds like jolly good fun to me and just to complete the record, the program was written by Steve Lee.

Area: *Games*
Company: *Virgin Games*
Address: *61/63 Portobello*
Road,
London W11 3DD
Telephone: *01 221 7535*

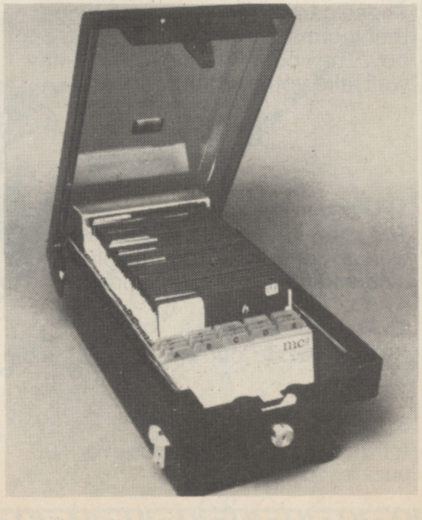
Securing those disks!

Have you ever wished that you had a decent system in which to keep all your precious disks rather than stashing them away in the cupboard or leaving them lying around the desk? If so, the Safer disk storage system from MC2 Limited could be just the thing for you.

This is a suspension based filing system which weighs in at 1.25Kg and has enough storage space for 80 disks. As a Commodore Approved Product as well as the actual storage box, you get the clips, dividers, card index, cards and self-adhesive labels for your £39.50 plus VAT. It's the clips that are at the heart of the system as they allow the user to suspend the disks in anti-static wallets which need never leave the box because of the special file retaining bars which are operated by the control switch at the front. For a bit of added security, the storage box is lockable.

Not only is the Safer system being sold in the UK but also in places as far away as Canada, Switzerland, Hong Kong, USA, South Africa and Italy.

Area: *Storage*
Company: *MC2 Limited*
Address: *262 The Broadway,*
Wimbledon, London
SW19 1SB
Telephone: *01 540 9370*



Could Dataview Have Created Legal History?

Legal Wrangle

Could legal history have been created in the computer industry? Dataview market a software protection system called DTL Protector which uses the well known dongle. Dataview said that a device called Master Key from F A W Electronics Limited threatened the DTL and Dataview served an injunction on F A W preventing them from marketing, selling or even giving away the Master Key.

An agreement has been worked out to the effect that Dataview recognise that F A W had no intention of deliberately pirating software and that the present injunction should serve perpetually according to Paul Handover, the chairman and managing director of Dataview.

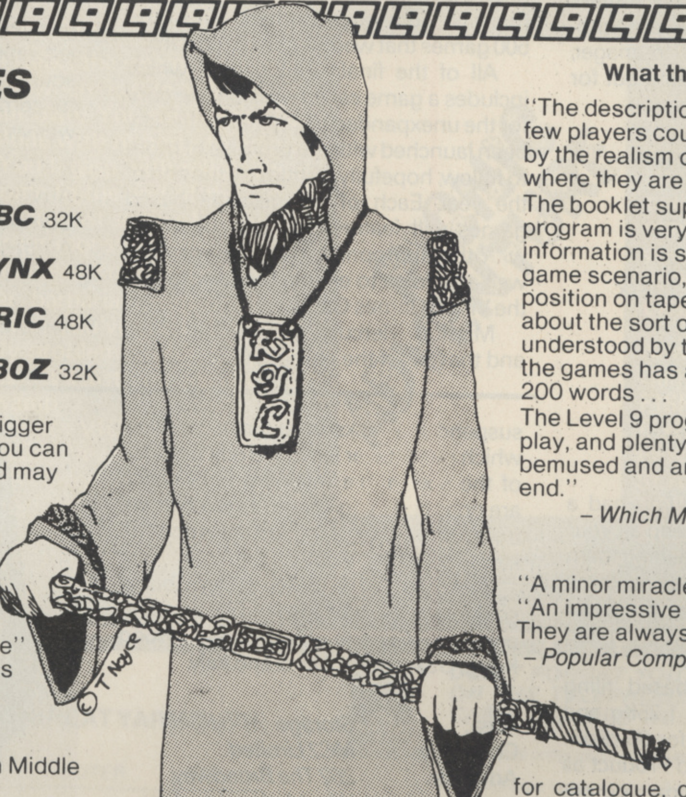
Dataview's case was based on case law which concerned itself with a third party acting in a way which induced a breach of contract between a supplier and their customer.

Communicating across the Atlantic

What have Cortex Computer Systems, Noranda Mines and the Prime 750 II computer got in common? Well Noranda Mines in Toronto selected Cortex in Bedford to design £60,000 worth of software for their Prime computer and thus replace an outdated batch system which was designed in the late 1960's. Noranda's business is selling metal to an international market and the pieces of software they required were the communications software packages Intercomm and Editor, both of which are written by Cortex and used on the 8000 series. The software was written in PL/1 using Pet's and stored on floppy disks and the information was then transmitted from England using the block mode to the Prime 700 in Toronto via British Telecom's Packet Switching Service and the International Packet Switching Service crossing the Atlantic either by satellite or by cable depending on the time of day. When the packet reached Teleglobe Canada it went to the Canadian Internal Packet-Switching Service called 'Datapac' at a rate of 1200 bps.

Why did Noranda Mines commission a company 3500 miles away to write the software? Well according to Tony Lilley, the Corporate Office Computer Services Manager for Noranda Mines, Cortex had "already proved their professional skills having worked out applications development for Noranda Sales Corporation of Canada; the European and Middle East Marketing branch of Noranda Mines based in London." Which just goes to show that if you do a good job, the spin-offs could be worth quite a lot.

Area:	*Communications*
Company:	*Cortex Computer Systems Limited*
Address:	*Cortex House,* *5 Albert Terrace,* *Union Street,* *Bedford MK40 2SF*



ADVENTURES

for

ATARI 400/800 32K **BBC** 32K
COMMODORE 64 **LYNX** 48K
NASCOM 32K **ORIC** 48K
SPECTRUM 48K **380Z** 32K

These games are very much bigger than normal adventures that you can buy. They cost £9.90 each and may well take you months to solve!

1) Colossal Adventure
The classic original "Adventure" with all the original puzzles plus a complete new Master Game.

2) Adventure Quest
An epic puzzle journey through Middle Earth.

3) Dungeon Adventure
A truly massive game with over 100 puzzles to solve.

Dealer Enquiries Welcome

What the reviewers say

"The descriptions are so good that few players could fail to be ensnared by the realism of the mythical worlds where they are the hero or heroine . . . The booklet supplied with each program is very helpful. Extensive information is supplied about the game scenario, saving your current position on tape and there are hints about the sort of words which are understood by the computer. Each of the games has a vocabulary of about 200 words . . .
The Level 9 programs are great fun to play, and plenty happens to keep you bemused and amused for hours on end."
– Which Micro & Software Review, August

"A minor miracle of programming", "An impressive suite of adventures. They are always a pleasure to play"
– Popular Computing Weekly, 12 May & 23 June

Send order, or SAE for catalogue, describing your micro, to:

LEVEL 9 COMPUTING

Dept I, 229 Hughenden Road
High Wycombe, Bucks HP13 5PG

SOUND TRAINING for WORDCRAFT*

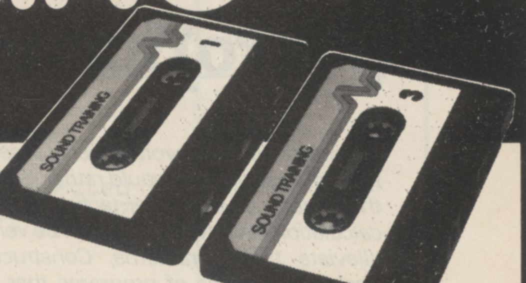
a faster, more enjoyable way to learn.

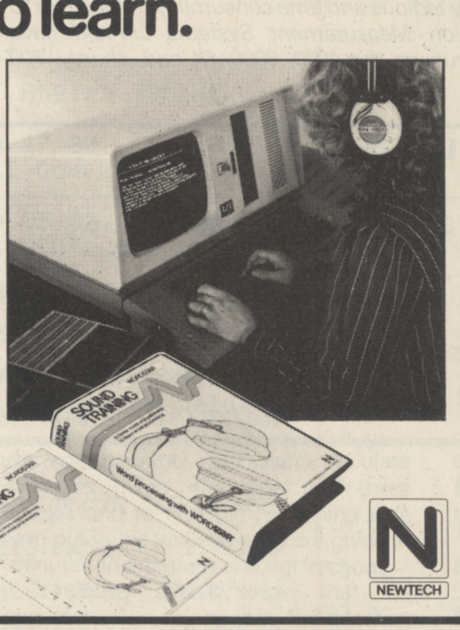
Word Processing with Wordcraft is a Sound Training pack that enables users to operate Wordcraft easily and effectively within only a few hours – without the need to rely on the manuals.

The **Word Processing with Wordcraft** package consists of two audio cassettes, reference book, checklists and job aids.

The interactive package is a complete, self-contained training course which involves listening to the tapes while operating the computer – and following the instructions when they are given.

It's an ideal way to learn – it's fast, enjoyable and effective.
Just as important, it builds up confidence in using the program.





Other Sound Training packs cover **Using Your CP/M Micro, Using Mailmerge, Word Processing with Wordstar, Introduction to Plannercalc** and other titles are planned for the future.
Price £40.00 (inclusive of VAT and postage).

NEWTECH

CC7

To Newtech Publishing Ltd, 8 Forge Court, Yateley,
Camberley, Surrey GU17 7RX. Telephone (0252) 873373

☐ Please send me ______ copy/ies of **WORD PROCESSING WITH WORDCRAFT** @ £40.00
☐ I enclose my remittance of £ ______
☐ Please invoice my company
☐ Please send me full details of your Sound Training packs

Name ______
Title ______
Company ______
Address ______
Signature ______ Date ______

* Wordcraft is a trademark of Dataview Ltd

hustler

UNQUESTIONABLY one of the best games available on the CBM 64 at half the price you would expect to pay.

Written in machine code and using sprite graphics to the full, HUSTLER takes game playing to new heights with its mixture of six games, for one or two players, and superb computer generated music.

Choose from:

1. One Player – ANY BALL ANY POCKET
2. One Player – BALLS IN ORDER
3. One Player – BALL IN ITS POCKET
4. Two Players – SCORE THE POCKETS
5. Two Players – MINI POOL
6. Two Players – LOWEST AND HIGHEST

HUSTLER also keeps track of High Scores.

ONLY £5·99

bubble bus

Send S.A.E. for list of 40 products for VIC20 and CBM64.
Games – Educational – Utility – Business from ***3.99*** *to* ***5.99***

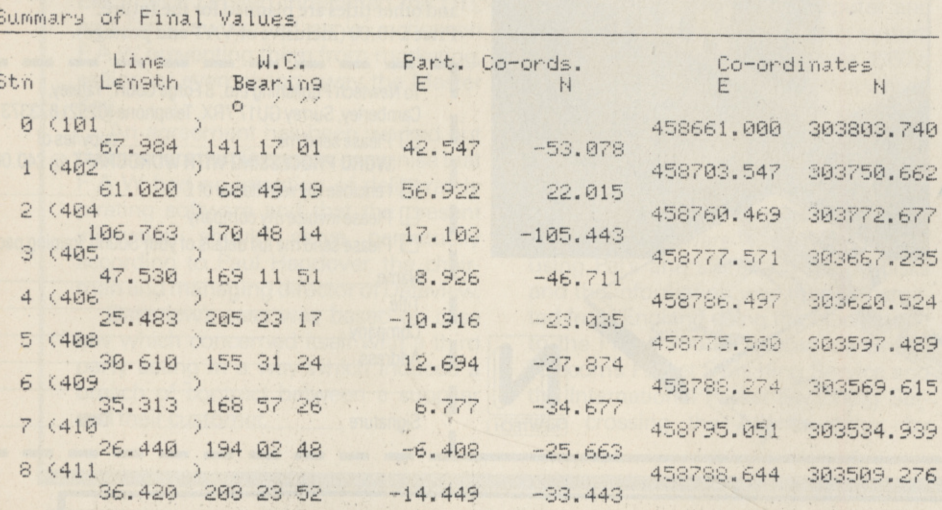
DEALER ENQUIRIES WELCOME
0732 355962

Post to: Bubble Bus Dept CCI 8/83
87 High Street, Tonbridge, Kent TN9 1RX
Please send me ____ Hustler
I enclose PO/Cheque for £ ____ + 50p P&P
Name ______
Address ______

APPLICATION STORY

(Micro)Surveying the Future

Architects and surveyors in general seem to be a pretty conservative and traditional type of person. They would rather rely on the old rule of thumb measure than accept the benefits of computer technology. Like almost any other job, there are a lot of calculations involved which can be very tedious and time consuming. In their aim to alleviate these problems, Construction Measurement Systems Limited have designed a series of programs that run on the 4000, 8000, 64 and, shortly, 700 machines.



```
TRAVERSE RESULTS
Summary of Final Values

       Line         W.C.         Part. Co-ords.            Co-ordinates
Stn    Length      Bearing        E           N            E            N
                   o  '  ''
  0 (101        )                                      458661.000  303803.740
      67.984   141 17 01      42.547     -53.078
  1 (402        )                                      458703.547  303750.662
      61.020    68 49 19      56.922      22.015
  2 (404        )                                      458760.469  303772.677
     106.763   170 48 14      17.102    -105.443
  3 (405        )                                      458777.571  303667.235
      47.530   169 11 51       8.926     -46.711
  4 (406        )                                      458786.497  303620.524
      25.483   205 23 17     -10.916     -23.035
  5 (408        )                                      458775.580  303597.489
      30.610   155 31 24      12.694     -27.874
  6 (409        )                                      458788.274  303569.615
      35.313   168 57 26       6.777     -34.677
  7 (410        )                                      458795.051  303534.939
      26.440   194 02 48      -6.408     -25.663
  8 (411        )                                      458788.644  303509.276
      36.420   203 23 52     -14.449     -33.443
```

Printout from TRAVERSE RESULTS

The range of programs come under the heading of Microsurvey and to set the system up with the 64, you need disc drive, printer and television set. The 64 set up at Leicester Polytechnic was connected to a 1541 disc drive, a Seikosha printer (which is very noisy, slow and the paper has to be adjusted manually every time you use it) and a Telefunken Palcolor television set.

There are 10 programs at the moment but 3 more are being developed one for setting the vertical curves for roads, another for calculating the horizontal curves for roads and the third is a sort of utilities program because the Traverse program does not read the coordinates from several traverses.

All of the programs are compiled and supplied on a 5¼" disc. Data entry is through the keyboard and output is either via the screen or on the printed format.

On the preliminary screen there appears a screen full of information that is used as a program reference guide.

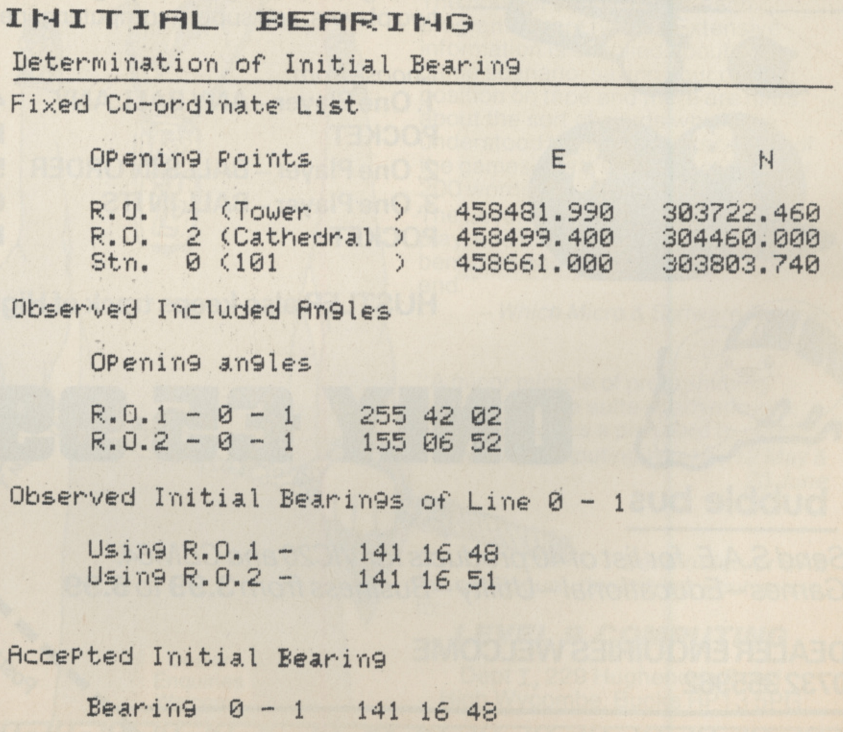
Each program has a unique name. For instance, the survey of the Leicester Royal Infirmary is code named 't-lri/hnd 3'.

Traverse is a set of four integrated programs each of which may be used for closed loop traverses, traverses closed between two coordinated points and open traverses. The first of these four programs determines the accepted bearing of the first line of a traverse survey. The program is called Initial Bearings and the data it deals with is the coordinates and names of the start station (which are points from where the surveying is actually done) and the coordinates of either one or two reference objects along with all the necessary angles measured from the start point. If the traverse is closed between two points then you must use the Bearings program to find the initial bearing and the adjusted bearing.

In either case with the latter program, both of the bearings are computed from one or two reference objects. The final values to be used are decided by the user and then the adjusted traverse bearings for the whole of the traverse are worked out. All of the data and results can be stored on a disk file which can be read at a later stage by the Traverse program. In any case, linear information may be entered in a program called Lines and read back from the disk file.

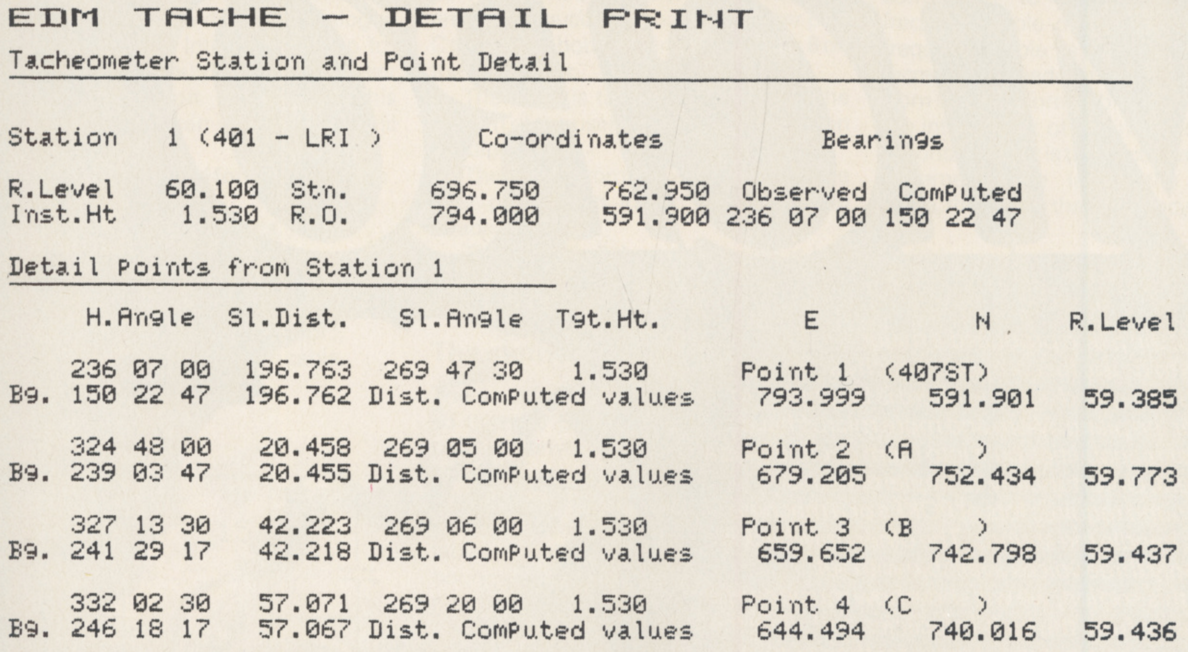
It is the Traverse program that computes the coordinates of the stations of the traverse survey and information can be read in from Bearings and Lines. The Traverse printout lists all the stations, coordinates, Eastings, Northings and the accuracy of the whole project is traverse accuracy, coordinate and angle misclosures. Along with this there is also the date, name of building, client and surveyor.

The final program in this suite is called Lines and this calculates the corrected lengths of survey lines measured on site using steel tapes. Each



```
INITIAL BEARING

Determination of Initial Bearing

Fixed Co-ordinate List

    Opening Points                     E             N

    R.O.   1 (Tower      )      458481.990    303722.460
    R.O.   2 (Cathedral  )      458499.400    304460.000
    Stn.   0 (101        )      458661.000    303803.740

Observed Included Angles

    Opening angles

    R.O.1 - 0 - 1      255 42 02
    R.O.2 - 0 - 1      155 06 52

Observed Initial Bearings of Line 0 - 1

    Using R.O.1 -      141 16 48
    Using R.O.2 -      141 16 51


Accepted Initial Bearing

    Bearing  0 - 1     141 16 48
```

Printout from INITIAL BEARING



```
EDM TACHE - DETAIL PRINT
Tacheometer Station and Point Detail

Station    1 (401 - LRI )        Co-ordinates            Bearings

R.Level   60.100  Stn.        696.750     762.950  Observed  Computed
Inst.Ht    1.530  R.O.        794.000     591.900 236 07 00  150 22 47

Detail Points from Station 1

      H.Angle   Sl.Dist.    Sl.Angle  Tgt.Ht.          E           N      R.Level

     236 07 00  196.763  269 47 30   1.530      Point 1  (407ST)
Bg.  150 22 47  196.762 Dist. Computed values    793.999     591.901    59.385

     324 48 00   20.458  269 05 00   1.530      Point 2  (A     )
Bg.  239 03 47   20.455 Dist. Computed values    679.205     752.434    59.773

     327 13 30   42.223  269 06 00   1.530      Point 3  (B     )
Bg.  241 29 17   42.218 Dist. Computed values    659.652     742.798    59.437

     332 02 30   57.071  269 20 00   1.530      Point 4  (C     )
Bg.  246 18 17   57.067 Dist. Computed values    644.494     740.016    59.436
```

Printout from EDM TACHE

survey line consists of one or more bays, each of these having a different slope. Once the data entry has been completed, the line data, corrections and corrected length are displayed. There are several correction options available for the slope, temperature variation and standardisation (that is the difference between actual and nominal tape lengths). The capacity of the program is limited to 25 lines with up to 5 bays in each line.

The next couple of programs that you come across belong to the Edmtache suite. What is Edmtache? This program deals with E.D.M. tacheometry which means that the coordinates and reduced levels of points observed from survey stations using electro-magnetic distance measurement methods. The data stored is relevant to the survey station and reference object. The height of the station and the instrument is also important. The only limit that is applied to storing data here is the size of the memory, as up to 50 detail points may be entered from one station. If a station has more than 50 detail points, it may be treated as if it was several different stations. Edmtache is practically the same as Edmplan except for the fact that the latter has a faster run time because no height data is entered.

With the trigonometry program (a calculation of trigonometrical routines) there are several operations like angle and distance conversions which appear on the main menu. Most of these options then lead to a further menu which allows you to calculate things like line bearing and length from set coordinates. Should you know the coordinates of the points and the lengths then you can calculate the coordinates of the new point. You can calculate triangles given one side and three angles and to find the remaining side you put in the values which are given in minutes and degrees and not fractions.

Anybody should know that the greatest value is opposite the greatest side length. On the calculation of areas there are many shapes which can be calculated like a conical trapezoid. Each routine chosen eventually leads the user back to the main menu.

There are three more programs in the Microsurvey range, these being Transform, Set Out and Levels.

The latter of these is designed to calculate reduced levels for contouring purposes. The printout from this program gives a detailed list of point numbers, back sight, inter sight and fore sight plus the original and adjusted levels. For example the listing for point number three might read a back sight of 1.502, fore sight 1.852, original level of 57.533 and adjusted level of 57.731.

Set Out determines the bearings and distances to plan points from a survey station, given the coordinates of the station and the points. One run of the program can handle four stations with as many as 25 points from each.

Finally there is Transform which transforms a set of point coordinates from one rectangular system to another. As long as you enter the coordinates of two points known in both systems, the values for one point are entered from one system and the values in the new system are computed automatically. One program run can handle up to 50 points.

At the moment these programs are available separately, although any combination of programs can be supplied as a system, there being a variety of systems possible depending on the needs of the user.

It is possible that Traverse can be accompanied by EDM, Bearings and Lines, EDM Tache by EDM Plan and Transform by Trigonometry and Set Out.

Each system has a Start routine which provides the disk operating system commands likely to be needed by the user. These systems are designed for dual disk drives, but potential users should note that these features cannot all be provided where a single disk drive is used.

The whole series of programs seems to have been very well thought out and put together. They have recently undergone modification so that the programs can handle "file exists", "no file found" and "disk full" errors. The program will not crash on either of these, but should these errors occur, the user may correct them without any loss of data.

The cost of the programs varies. For individual programs the price range is from £75 to £200 and the average price for the systems is about £300. These prices do not include VAT, but do include free support for six months and one free run-time key for orders worth more than £150. There are also special discounts for educational institutions.

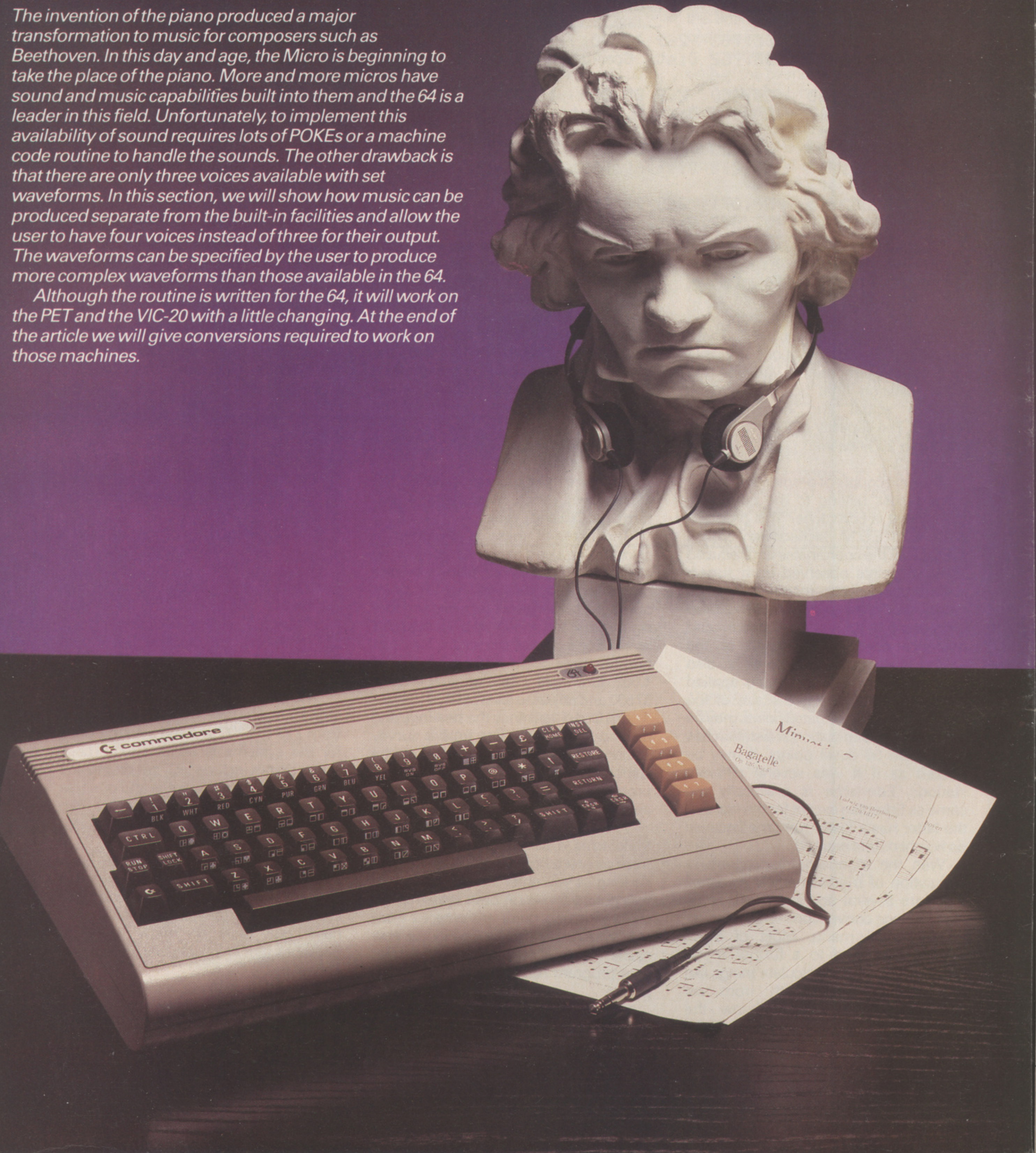
Taking all the modifications and offers into account, whether you want to buy individual programs or complete systems, CMS Limited look as if they have put together many excellent packages that any customer should find appealing.

Construction Measurement Systems Limited can be contacted at Haford, Peatling Magna, Leicester LE8 3UQ, Telephone 0537 58 283.

Music on your MICRO

The invention of the piano produced a major transformation to music for composers such as Beethoven. In this day and age, the Micro is beginning to take the place of the piano. More and more micros have sound and music capabilities built into them and the 64 is a leader in this field. Unfortunately, to implement this availability of sound requires lots of POKEs or a machine code routine to handle the sounds. The other drawback is that there are only three voices available with set waveforms. In this section, we will show how music can be produced separate from the built-in facilities and allow the user to have four voices instead of three for their output. The waveforms can be specified by the user to produce more complex waveforms than those available in the 64.

Although the routine is written for the 64, it will work on the PET and the VIC-20 with a little changing. At the end of the article we will give conversions required to work on those machines.

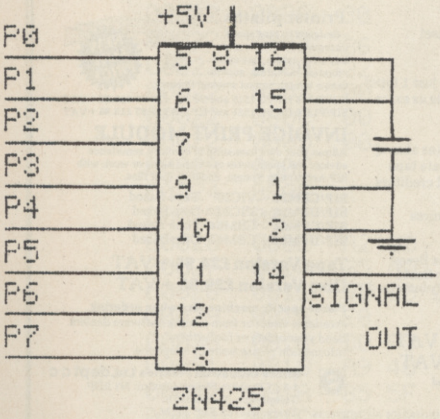


The circuitry

The output produced by the machine code routine is sent to the user port which is then fed through a digital to analogue converter and back into the SID chip for amplification and output to the speaker inside the television. As without this circuitry no sound can be heard, we will start with this.

Components required for the complete circuit are:

1 Vero board to take i/c sockets,
2 16 pin i/c sockets,
1 5 pin DIN plug,
1 Edge connector to fit user port,
1 Capacitor with a small value (33pF),
1 16 Pin dip header with ribbon cable,
Some .2 gauge hook up wire,
1 ZN425 D to A chip.



The only other electrical connections required are the connections of the user port to the ribbon cable. Values P0 to P7 are the 8 input/output bits of the user port C to L on the bottom wired to pins 1 to 8 on the dip header.

The earth is taken from pin A on the bottom of the user port, wired to pin 16 on the dip header.

The +5V is from pin 2 on the top of the user port, wired to pin 15 on the dip header.

The cost of all the components is less than £10.

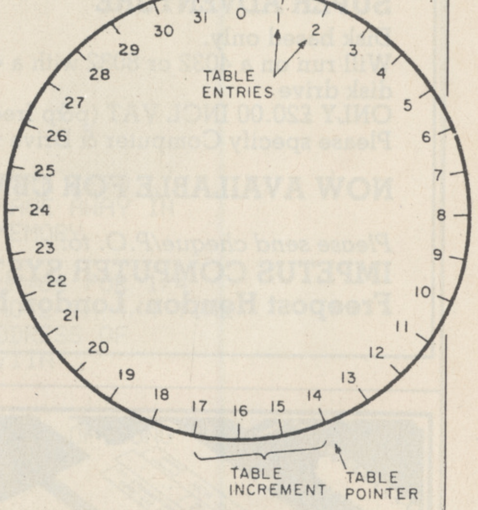
The method

The waveform tables are 256 bytes long so that the pointers to the tables never point to anything but the tables themselves. The tables are circular and contain one full cycle of a musical waveform. The last thing to be said about the set up of the tables is that they do not cross any page boundaries as if they did, the timing of a note could be slightly put out.

In order to create a waveform with a given frequency, the program is designed to skip a fractional number of table entries to get the next sample value. This fractional number is called the table increment value. The process is continued around the table for one revolution to create a complex waveform. The cycle is repeated until the duration counter is zero.

The program reads in the duration value and the four note numbers which correspond to the position on the frequency table of the actual note. The frequency table is set with the actual increments needed to get the frequency from the waveform tables. The first byte is the integer part of the increment and the second number is the fractional part of the increment. The larger the increment value, the higher the frequency output will be.

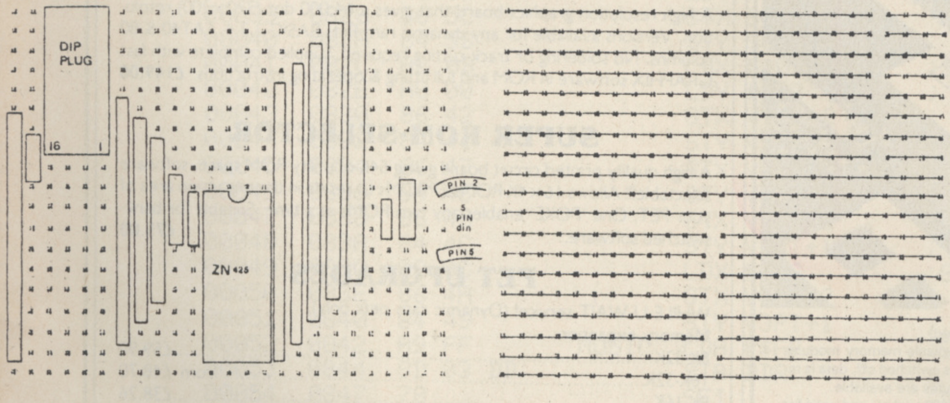
This process is repeated for each line in the song table until either a '1' or a '0' are encountered as the duration. If the value is a '1', the next two bytes are the address of the next segment of code. This can be very useful if certain routines of music must be repeated. If the value is a '0', the program terminates as it is the end of music marker.



As was mentioned earlier, you can have four voices all with different waveforms. This is done by not allowing the values in the waveform tables to be greater than 63 and the output is produced by adding together the values obtained from the waveform tables which gives a value less than 255.

All of the commands used in the routine were picked for their speed as well as for what they do and any time loss by branches are compensated by the routine at TIMWAS to waste time.

Shown above, the circuit. Below the circuit layout on veroboard



Assembler Listing Of Machine Code And Frequency Table

```
00001  0000            USRPRT =$DD01          ;USER PORT REGISTER
00002  0000            DDR    =$DD03          ;DATA DIRECTION REG
00003  0000            V1PT   =$40            ;WAVEFORM TABLE
00004  0000            V2PT   =$45            ; POINTERS FOR
00005  0000            V3PT   =$48            ; THE FOUR VOICES
00006  0000            V4PT   =$4B
00007  0000            INCPT  =$4E            ;TO V1IN - V4IN
00008  0000            NOTES  =$50            ;NOTES POINTER
00009  0000            V1IN   =$52            ;INCREMENT POINTERS
00010  0000            V2IN   =$54            ; FOR THE FOUR
00011  0000            V3IN   =$56            ; VOICES
00012  0000            V4IN   =$58
00013  0000            DUR    =$5A            ;DURATION COUNTER
00014  0000            SONGA  =$5B            ;ADDRESS OF SONG
```

DISCOVER ADVENTURE

THE ULTIMATE

PET GAME

ADVENTURE
Will run on any 32K PET
Available on cassette or disk
ONLY £11.50 INCL VAT (p&p free)
Please specify whether cassette or disk required.

SUPER ADVENTURE
Disk based only.
Will run on a 4032 or 8032 with a 4040 or 8050 disk drive
ONLY £20.00 INCL VAT (p&p free)
Please specify Computer & Drive when ordering.

NOW AVAILABLE FOR CBM 64

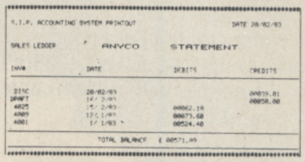
Please send cheque/P.O. to:
IMPETUS COMPUTER SYSTEMS
Freepost Hendon, London NW4 1YB

NOW AVAILABLE ON DISC

For VIC 20 and CBM 64 Users

SIP ACCOUNTING SYSTEM

Highly comprehensive program designed for 16K, 24K, VIC20 & Printer, 40 col VIC20, CBM 64. Makes an ideal introduction for you and your staff to the world of computer accounts.



```
S.I.P. ACCOUNTING SYSTEM PRINTOUT                DATE 20/02/83

SALES LEDGER        ANYCO        STATEMENT

INV#          DATE                DEBITS            CREDITS

 DISC         20/02/83                              00039.01
DRAFT         16/ 2/83                              00050.00
 4025         15/ 2/83            00062.10
 4009         12/ 1/83            00073.60
 4001          1/ 1/83            00524.40

               TOTAL BALANCE   £ 00571.09
```

Features include:
- Menu driven – simplicity to use!
- Up to 250 accounts per tape
- Day book
- Sales and purchase ledger (or just 1 type)
- Invoice print module available as extra.
- Statements print
  (for all or just one company)
- Overdue account statements (as above)
- End period carry on to next data tape
- Cash summary – debitors and creditors
- VAT entry (net or gross)
- PLUS many, many more features
  – all in ONE program.

SIP/AC20 – VIC20 16/24K Tape Based
SIP/DC20 – VIC20 16/24K Disc Based
SIP/AC40 – VIC20 16/24K +40 column card
SIP/AC64 – CBM64 Tape Based
SIP/DC64 – CBM64 Disc Based

Tape Version £24.95 + VAT
Disc Version £29.95 + VAT
Price includes comprehensive manual (+ data tape for tape versions).
1515/1525/1526/GP 100 VC printer required for all programs.

Printer plinths
– designed to save space, improve paper flow, and tidy stray cables, has anti-vibration mounting, superb design in high impact smoked Perspex.

NEW LOW PRICE

SIP/P1515 for VC 1515 and GP 80 ~~£17.95~~ **£12.95** + VAT
SIP/P1525 for VC 1525 and GP 100 ~~£18.95~~ **£13.95** + VAT

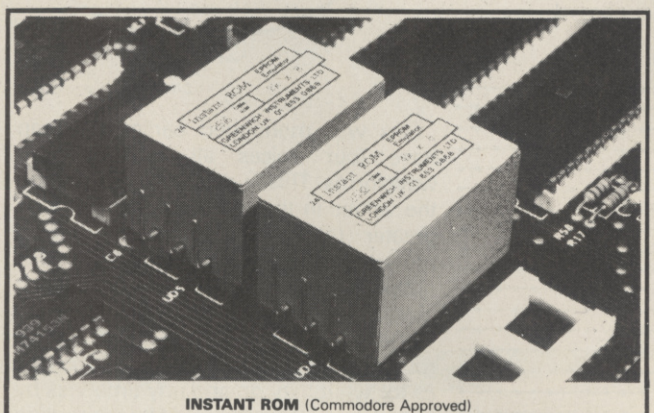
INVOICE PRINT MODULE
Allows your own formating of invoices, remittance advices and credit notes can stand alone or work with SIP Accounting System, updating data files.

SIP/CPM20 – VIC20 Tape Based
SIP/DPM20 – VIC20 Disc Based
SIP/CPM64 – CBM64 Tape Based
SIP/DPM64 – CBM64 Disc Based

Tape Version £24.95 + VAT
Disc Version £29.95 + VAT
Please specify machine size when ordering
Available direct or from leading Software dealers. Send your orders or for further information please write or telephone:

Shore Industrial Plastics Ltd. dept C C
1-13 Corsham Street, London N1 6DP.
Telephone: 01-250 1978.
Telex: 943763 Ref. SHM

CC1 SEPT



INSTANT ROM (Commodore Approved)
Greenwich Instruments' ROM/EPROM Emulators are non-volatile memory modules which plug into any ROM/EPROM socket. When the power is switched off, data is retained for up to 10 years. Emulators from 2 Kbytes to 32Kbytes are available.
In the PET, a 4Kbyte Emulator can be fitted in the 9000 or A000 socket, and used for fast program development. Basic or Machine-code programs can be stored permanently.

GR2532 4Kbyte Emulator	£56.00
Adaptor GA1 (essential for PET users)	£ 6.00

PETCLOCK (Commodore Approved)
PETCLOCK plugs into any Commodore machine with User-Port, and gives time (hour/minute/second) and date (year/month/date/day of week). Battery backup—accuracy is maintained when the power is off.

GCC1 PETCLOCK	£62.00

G-ROM E
A 4 Kbyte EPROM which runs, at switch-on, any Basic or Machine-code program stored in INSTANT ROM, eliminating the need for tape or disc. Basic programs can be stored with a few key-strokes.
Some powerful utilities are included for program revival. PET's power-up memory test is made non-destructive, and UN-NEW us provided. A program for reading Date and time from PETCLOCK is also included.

G-ROM E (specify type of PET)	£25.00

Postage (£1.00) and VAT are extra. Leaflets are available.

GREENWICH INSTRUMENTS LIMITED, 22 BARDSLEY LANE, GREENWICH, LONDON SE10 9RF.
Tel: 01-853 0868. Telex 896691 Attn. GIL.

HI-RESOLUTION GRAPHICS

A high resolution graphics board that gives a 64,000 dot (320×200) resolution. Versions available for any dynamic ram Pet, BASIC 2,3,4, FAT40 & 80 columns. No soldering or track cutting required, supplied complete with fast GRAPHIX software in ROM and full fitting & operating instructions. **£149.00**

SUPER ROM-SELECTOR

A high quality printed circuit board giving 64K of utility ROM space, software selectable!!! Allows 16×4K ROMs/EPROMs to reside in the expansion area of your PET. One 'POKE' enables any two ROMs at a time. Suitable for bank-switched software. **£75.00**

PET UPGRADES

WHILE-U-WAIT service! (Dynamic ram pets only).
Memory expansion:

8K-32K	£59.90
16K-32K	from £48.70
8K-16K	£38.26

40 column (12in VDU only) to 80 column conversion.

40-80 column	£89.00
40-80 column switchable (two machines in one!)	£105.00

Full keyboard functions: i.e. TAB, ESC, REPEAT, SCROLL up/down, define WINDOW, lowercase/graphics mode and DELETE from/to cursor. All available in direct or program mode.

REPAIRS AND SERVICING

Fast and efficient repairs to all Commodore Business Machines at reasonable prices. WHILE-U-WAIT service whenever possible.

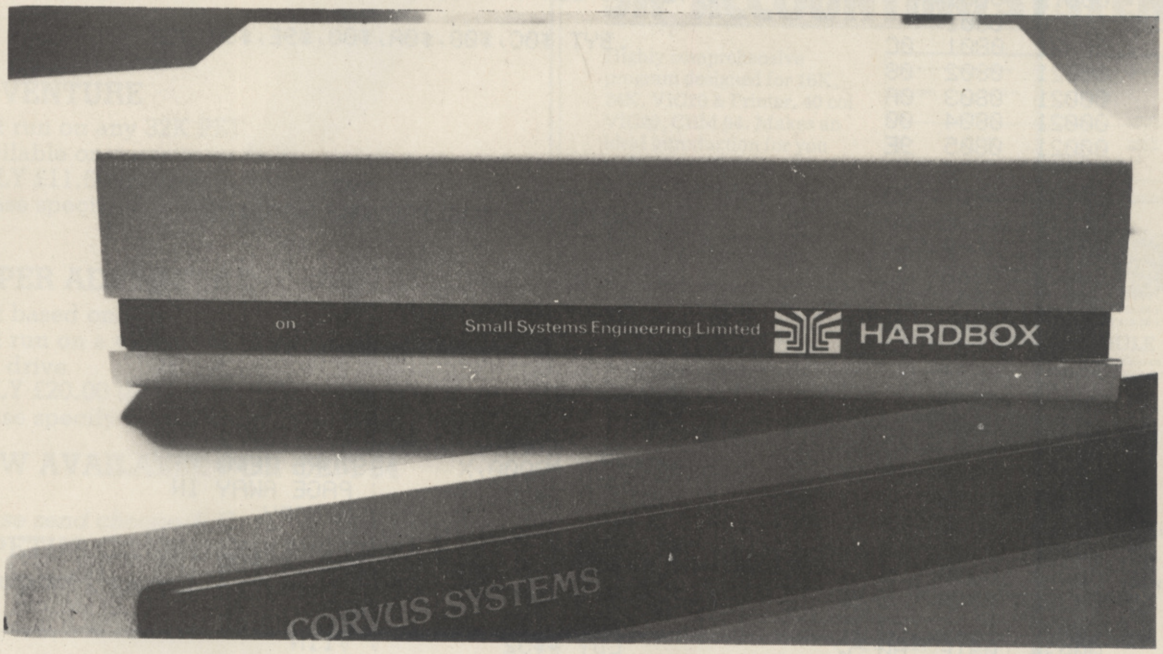
Please add VAT to the prices shown at the current rate.

Telephone Mick Bignell for more details at:

7 Clydesdale Close,
Borehamwood, Herts. WD6 2SD.
Tel: 01-953 8385

```
00015  0000           INCA   =$5D          ;INITIAL INCPT
00016  0000           TEMPO  =$5F          ;TEMPO VALUE
00017  0000           *      =$0801
00018  0801           ;
00019  0801           ;BYTES TO SET UP '10 SYS02062'
00020  0801           ;
00021  0801  0C              .BYT $0C,$08,$0A,$00,$9E,$30,$32
00021  0802  08
00021  0803  0A
00021  0804  00
00021  0805  9E
00021  0806  30
00021  0807  32
00022  0808  30              .BYT $30,$36,$32,$00,$00,$00
00022  0809  36
00022  080A  32
00022  080B  00
00022  080C  00
00022  080D  00
00023  080E           ;
00024  080E           ;ENTRY POINT
00025  080E           ;
00026  080E  A2 00           LDX #$00
00027  0810  B5 00    STORE  LDA $0000,X    ;STORE ZERO
00028  0812  9D 00 0A        STA $0A00,X    ; PAGE AWAY IN
00029  0815  E8              INX            ; MEMORY
00030  0816  D0 F8           BNE STORE
00031  0818  A9 40           LDA #64        ;DUR=64 FOR 1/4
00032  081A  85 5F           STA TEMPO      ; NOTE IN 4/4 TIME
00033  081C  A2 00           LDX #$00       ;ADDRESS OF
00034  081E  A0 52           LDY #$52       ; V1IN
00035  0820  86 5E           STX INCA+1
00036  0822  84 5D           STY INCA
00037  0824  A2 0E           LDX #$0E       ;START OF SONG
00038  0826  A0 00           LDY #$00       ; TABLE
00039  0828  86 5C           STX SONGA+1
00040  082A  84 5B           STY SONGA
00041  082C  A2 0B           LDX #$0B       ;START OF FIRST
00042  082E  A0 00           LDY #$00       ; WAVEFORM TABLE
00043  0830  86 42           STX V1PT+2     ; FOR VOICES 1
00044  0832  84 41           STY V1PT+1     ;
00045  0834  86 47           STX V2PT+2     ;           2
00046  0836  84 46           STY V2PT+1     ;
00047  0838  86 4D           STX V4PT+2     ; AND       4
00048  083A  84 4C           STY V4PT+1     ;
00049  083C  A2 0C           LDX #$0C       ;START OF WAVEFORM
00050  083E  86 4A           STX V3PT+2     ; TABLE FOR VOICE
00051  0840  84 49           STY V3PT+1     ;           3
00052  0842  A9 FF    MUSIC  LDA #$FF       ;SET DDR TO
00053  0844  8D 03 DD        STA DDR        ; OUTPUT
00054  0847  78              SEI            ;DISSABLE INTERUPTS
00055  0848  A9 8F           LDA #$8F       ;SET VOLUME AND
00056  084A  8D 18 D4        STA $D418      ; TURN OFF SID VOICES
00057  084D  A9 0B           LDA #$0B       ;BLANK SCREEN
00058  084F  8D 11 D0        STA $D011      ; AS IS N.M.I.
00059  0852  D8              CLD            ;ENSURE BINARY
00060  0853  A5 5B           LDA SONGA      ;SET POINTER TO
00061  0855  85 50           STA NOTES      ; NOTES
00062  0857  A5 5C           LDA SONGA+1
00063  0859  85 51           STA NOTES+1
00064  085B  A0 00    MUSIC1 LDY #$00       ;SET UP TO
00065  085D  A5 5D           LDA INCA       ; TRANSLATE FOUR
00066  085F  85 4E           STA INCPT      ; VOICES INTO INCREMENTS
00067  0861  B1 50           LDA (NOTES),Y  ;GET DURATION
```

HARDBOX – Hard Disks for Commodore Micro-Computers



HARD DISK INTERFACE

HARDBOX is the intelligent controller that lets you add a Corvus hard disk drive to your Commodore computer. In fact, you can chain up to 4 hard disk drives of 6, 11 or 20 Megabyte capacities.

Compatible with CBM DOS versions 1 and 2, the HARDBOX operates with existing Commodore programs and appears to the Commodore as a high speed, high capacity floppy drive.

Multi-User System

Create a multi-user network by adding the Corvus Constellation multiplexer to your hard disk system. With a HARDBOX at each work station, up to 64 users can simultaneously access the same drive.

As a multi-user system, the HARDBOX provides:

- Separate user areas on each hard disk.
- Multi-user work areas for shared programs.
- File and record locking for shared databases.
- Password protection of user areas.
- Access to any user area from any station using the password.

Video Cassette Backup

The HARDBOX supports the Corvus *Mirror Option.* This provides a high-speed, low cost means of backup, using a commercial video cassette recorder. Backup speeds of 7½ kilobytes per second let you save contents of a 10 MByte drive in less than 20 minutes. Video cassette capacity is approximately 100 Megabytes.

Hardware Requirements

- Commodore 3000, 4000, or 8000 series computer with BASIC 2 or 4.
- One HARDBOX and PET-IEEE cable per work station.
- Corvus bare drive and ribbon cable.
- Access to a floppy disk or cassette.

Price..£495.00

small systems engineering limited

2-4 Canfield Place, London NW6 3BT. Telephone: 328 7145 Telex **264538**

Distributed in the UK by:

Carfleet Control, Ltd., Cannon House, 2255, Coventry Road, Sheldon, Birmingham B26 3NX. Tel: 021-742 8771.
Computer Sales and Software Centre, Ltd., 190/192, Cranbrook Road, Ilford, Essex IG1 4LU. Tel: 01-554 3344.

```
00068  0863  F0 3E             BEQ ENDSNG        ;IF '0' END
00069  0865  C9 01             CMP #$01          ;IF '1' GOTO NEXT
00070  0867  F0 2B             BEQ NXTSEG        ; SEGMENT OF SONG
00071  0869  85 5A             STA DUR           ;ELSE IS DURATION
00072  086B  E6 50     MUSIC2  INC NOTES         ;INCREMENT NOTES
00073  086D  D0 02             BNE MUSIC3        ; POINTER
00074  086F  E6 51             INC NOTES+1
00075  0871  B1 50     MUSIC3  LDA (NOTES),Y     ;READ IN FOUR
00076  0873  AA                TAX               ; VOICES AND STORE
00077  0874  BD 01 0D          LDA FRQTAB+1,X    ; IN VOICE INCREMENT
00078  0877  91 4E             STA (INCPT),Y     ; LOCATIONS
00079  0879  E6 4E             INC INCPT
00080  087B  BD 00 0D          LDA FRQTAB,X
00081  087E  91 4E             STA (INCPT),Y
00082  0880  E6 50             INC NOTES
00083  0882  D0 02             BNE MUSIC4
00084  0884  E6 51             INC NOTES+1
00085  0886  E6 4E     MUSIC4  INC INCPT         ;REPEAT FOR
00086  0888  A5 4E             LDA INCPT         ; OTHER VOICES
00087  088A  C9 5A             CMP #V4IN+2
00088  088C  D0 E3             BNE MUSIC3
00089  088E  20 B9 08          JSR PLAY          ;PLAY THE NOTES
00090  0891  4C 5B 08          JMP MUSIC1        ;GOTO NEXT LINE
00091  0894            ;
00092  0894  C8        NXTSEG  INY               ;GOTO NEW SONG AREA
00093  0895  B1 50             LDA (NOTES),Y
00094  0897  48                PHA
00095  0898  C8                INY
00096  0899  B1 50             LDA (NOTES),Y
00097  089B  85 51             STA NOTES+1
00098  089D  68                PLA
00099  089E  85 50             STA NOTES
00100  08A0  4C 5B 08          JMP MUSIC1
00101  08A3            ;
00102  08A3  A2 00     ENDSNG  LDX #$00          ;DUR=0
00103  08A5  BD 00 0A  RSTORE  LDA $0A00,X       ;RESTORE ZERO
00104  08A8  95 00             STA $0000,X       ; PAGE
00105  08AA  E8                INX
00106  08AB  D0 F8             BNE RSTORE
00107  08AD  A9 1B             LDA #$1B          ;RESTORE SCREEN
00108  08AF  8D 11 D0          STA $D011
00109  08B2  A9 00             LDA #$00          ;TURN SID VOL OFF
00110  08B4  8D 18 D4          STA $D418
00111  08B7  58                CLI               ;RESET INTERUPTS
00112  08B8  60                RTS               ;RETURN TO BASIC
00113  08B9            ;
00114  08B9  A0 00     PLAY    LDY #$00          ;PLAY THE NOTES
00115  08BB  A6 5F             LDX TEMPO
00116  08BD            ;
00117  08BD  18        PLAY1   CLC
00118  08BE  B1 41             LDA (V1PT+1),Y    ;SUM WAVEFORMS
00119  08C0  71 46             ADC (V2PT+1),Y    ; OF FOUR VOICES
00120  08C2  71 49             ADC (V3PT+1),Y    ; FOR OUTPUT
00121  08C4  71 4C             ADC (V4PT+1),Y    ;
00122  08C6  8D 01 DD          STA USRPRT        ;SEND TO USER PORT
00123  08C9  A5 40             LDA V1PT          ;ADD INCREMENTS
00124  08CB  65 52             ADC V1IN          ; TO THE FOUR WAVE-
00125  08CD  85 40             STA V1PT          ; FORM TABLE POINTERS
00126  08CF  A5 41             LDA V1PT+1        ; VOICE 1
00127  08D1  65 53             ADC V1IN+1
00128  08D3  85 41             STA V1PT+1
00129  08D5  A5 45             LDA V2PT          ;          2
00130  08D7  65 54             ADC V2IN
00131  08D9  85 45             STA V2PT
```

```
00132  08DB  A5 46           LDA V2PT+1
00133  08DD  65 55           ADC V2IN+1
00134  08DF  85 46           STA V2PT+1
00135  08E1  A5 48           LDA V3PT        ;         3
00136  08E3  65 56           ADC V3IN
00137  08E5  85 48           STA V3PT
00138  08E7  A5 49           LDA V3PT+1
00139  08E9  65 57           ADC V3IN+1
00140  08EB  85 49           STA V3PT+1
00141  08ED  A5 4B           LDA V4PT        ;         4
00142  08EF  65 58           ADC V4IN
00143  08F1  85 4B           STA V4PT
00144  08F3  A5 4C           LDA V4PT+1
00145  08F5  65 59           ADC V4IN+1
00146  08F7  85 4C           STA V4PT+1
00147  08F9  CA              DEX
00148  08FA  D0 08           BNE TIMWAS      ;WASTE TIME
00149  08FC  C6 5A           DEC DUR         ;DECREMENT DURATION
00150  08FE  F0 0C           BEQ ENDNOT      ;IF DUR=0 THEN NEXT LINE
00151  0900  A6 5F           LDX TEMPO
00152  0902  D0 B9           BNE PLAY1
00153  0904  D0 00    TIMWAS BNE *+2         ;WASTE TIME
00154  0906  D0 00           BNE *+2
00155  0908  D0 00           BNE *+2
00156  090A  D0 B1           BNE PLAY1
00157  090C  60       ENDNOT RTS
00158  090D           ;
00159  090D           *      =$0D00          ;ID NOTE
00160  0D01  00
00161  0D02  01              .BYT 1,233      ; 2 C2
00161  0D03  E9
00162  0D04  02              .BYT 2,6        ; 4 C2#
00162  0D05  06
00163  0D06  02              .BYT 2,37       ; 6 D2
00163  0D07  25
00164  0D08  02              .BYT 2,69       ; 8 D2#
00164  0D09  45
00165  0D0A  02              .BYT 2,104      ;10 E2
00165  0D0B  68
00166  0D0C  02              .BYT 2,140      ;12 F2
00166  0D0D  8C
00167  0D0E  02              .BYT 2,179      ;14 F2#
00167  0D0F  B3
00168  0D10  02              .BYT 2,220      ;16 G2
00168  0D11  DC
00169  0D12  03              .BYT 3,8        ;18 G2#
00169  0D13  08
00170  0D14  03              .BYT 3,54       ;20 A2
00170  0D15  36
00171  0D16  03              .BYT 3,103      ;22 A2#
00171  0D17  67
00172  0D18  03              .BYT 3,154      ;24 B2
00172  0D19  9A
00173  0D1A  03              .BYT 3,209      ;26 C3
00173  0D1B  D1
00174  0D1C  04              .BYT 4,11       ;28 C3#
00174  0D1D  0B
00175  0D1E  04              .BYT 4,73       ;30 D3
00175  0D1F  49
00176  0D20  04              .BYT 4,138      ;32 D3#
00176  0D21  8A
00177  0D22  04              .BYT 4,207      ;34 E3
00177  0D23  CF
00178  0D24  05              .BYT 5,25       ;36 F3
```

```
00178  0D25  19
00179  0D26  05                .BYT 5,102      ;38 F3#
00179  0D27  66
00180  0D28  05                .BYT 5,184      ;40 G3
00180  0D29  B8
00181  0D2A  06                .BYT 6,15       ;42 G3#
00181  0D2B  0F
00182  0D2C  06                .BYT 6,108      ;44 A3
00182  0D2D  6C
00183  0D2E  06                .BYT 6,205      ;46 A3#
00183  0D2F  CD
00184  0D30  07                .BYT 7,53       ;48 B3
00184  0D31  35
00185  0D32  07                .BYT 7,163      ;50 C4
00185  0D33  A3
00186  0D34  08                .BYT 8,23       ;52 C4#
00186  0D35  17
00187  0D36  08                .BYT 8,146      ;54 D4
00187  0D37  92
00188  0D38  09                .BYT 9,21       ;56 D4#
00188  0D39  15
00189  0D3A  09                .BYT 9,159      ;58 E4
00189  0D3B  9F
00190  0D3C  0A                .BYT 10,49      ;60 F4
00190  0D3D  31
00191  0D3E  0A                .BYT 10,204     ;62 F4#
00191  0D3F  CC
00192  0D40  0B                .BYT 11,113     ;64 G4
00192  0D41  71
00193  0D42  0C                .BYT 12,31      ;66 G4#
00193  0D43  1F
00194  0D44  0C                .BYT 12,215     ;68 A4
00194  0D45  D7
00195  0D46  0D                .BYT 13,155     ;70 A4#
00195  0D47  9B
00196  0D48  0E                .BYT 14,106      ;72 B4
00196  0D49  6A
00197  0D4A  0F                .BYT 15,69      ;74 C5
00197  0D4B  45
00198  0D4C  10                .BYT 16,46      ;76 C5#
00198  0D4D  2E
00199  0D4E  11                .BYT 17,36      ;78 D5
00199  0D4F  24
00200  0D50  12                .BYT 18,41      ;80 D5#
00200  0D51  29
00201  0D52  13                .BYT 19,62      ;82 E5
00201  0D53  3E
00202  0D54  14                .BYT 20,98      ;84 F5
00202  0D55  62
00203  0D56  15                .BYT 21,153      ;86 F5#
00203  0D57  99
00204  0D58  16                .BYT 22,226      ;88 G5
00204  0D59  E2
00205  0D5A  18                .BYT 24,62       ;90 G5#
00205  0D5B  3E
00206  0D5C  19                .BYT 25,175     ;92 A5
00206  0D5D  AF
00207  0D5E  1B                .BYT 27,54      ;94 A5#
00207  0D5F  36
00208  0D60  1C                .BYT 28,212     ;96 B5
00208  0D61  D4
00209  0D62  1E                .BYT 30,139      ;98 C5
00209  0D63  8B
00210  0D64
00211  0D64              END
```

← Monitor Dumps Of Waveform Tables

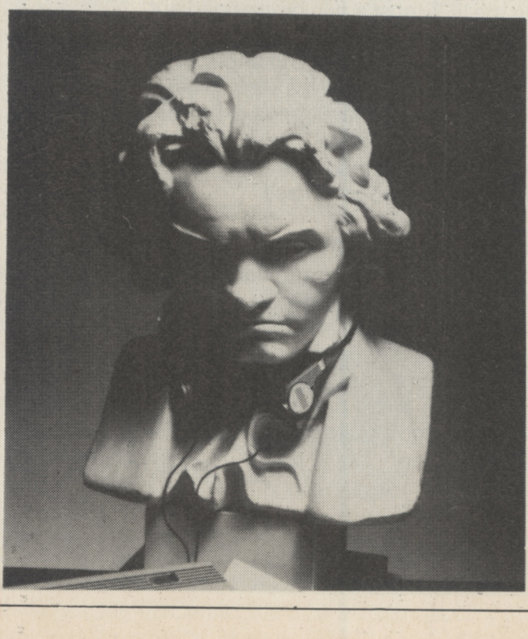
```
READY.

B*
   PC   SR AC XR YR SP
 ;C03E 32 00 C3 00 F6


  :0B00 33 34 35 36 36 37 38 39
  :0B08 39 3A 3A 3B 3B 3B 3C 3C
  :0B10 3C 3C 3C 3C 3C 3C 3C 3C
  :0B18 3C 3C 3C 3B 3B 3B 3B 3B
  :0B20 3A 3A 3A 3A 3A 3A 39 39
  :0B28 39 39 39 39 39 39 39 39
  :0B30 3A 3A 3A 3A 3A 3B 3B 3B
  :0B38 3B 3C 3C 3C 3D 3D 3D 3D
  :0B40 3E 3E 3E 3E 3F 3F 3F 3F
  :0B48 3F 3F 3F 3F 3F 3F 3F 3F
  :0B50 3E 3E 3E 3D 3D 3C 3C 3B
  :0B58 3B 3A 39 38 38 37 36 35
  :0B60 34 33 32 31 30 2F 2E 2D
  :0B68 2C 2B 2A 29 28 27 26 25
  :0B70 24 23 22 21 21 20 1F 1F
  :0B78 1E 1E 1D 1D 1D 1D 1C 1C
  :0B80 1C 1C 1D 1D 1D 1D 1D 1E
  :0B88 1E 1F 1F 20 20 21 21 22
  :0B90 23 23 24 24 25 26 26 27
  :0B98 28 28 29 29 29 2A 2A 2B
  :0BA0 2B 2B 2B 2B 2B 2B 2B 2A
  :0BA8 2A 2A 29 29 28 27 27 26
  :0BB0 25 24 23 22 21 20 1F 1D
  :0BB8 1C 1B 19 18 17 15 14 13
  :0BC0 11 10 0F 0D 0C 0B 09 08
  :0BC8 07 06 05 04 03 03 02 01
  :0BD0 01 00 00 00 00 00 00 00
  :0BD8 00 00 01 01 01 02 03 04
  :0BE0 05 06 07 08 09 0B 0C 0D
  :0BE8 0F 10 12 13 15 16 18 1A
  :0BF0 1B 1D 1F 20 22 23 25 27
  :0BF8 28 2A 2B 2C 2E 2F 30 31
  :0C00 00 00 00 00 00 00 00 00
  :0C08 00 00 00 00 00 00 00 00
  :0C10 00 00 00 00 00 00 00 00
  :0C18 00 00 00 00 00 00 00 00
  :0C20 00 00 00 00 00 00 00 00
  :0C28 00 00 00 00 00 00 00 00
  :0C30 00 00 00 00 00 00 00 00
  :0C38 00 00 00 00 00 00 00 00
  :0C40 00 00 00 00 00 00 00 00
  :0C48 00 00 00 00 00 00 00 00
  :0C50 00 00 00 00 00 00 00 00
  :0C58 00 00 00 00 00 00 00 00
  :0C60 00 00 00 00 00 00 00 00
  :0C68 00 00 00 00 00 00 00 00
  :0C70 00 00 00 00 00 00 00 00
  :0C78 00 00 00 00 00 00 00 00
  :0C80 3F 3F 3F 3F 3F 3F 3F 3F
  :0C88 3F 3F 3F 3F 3F 3F 3F 3F
  :0C90 3F 3F 3F 3F 3F 3F 3F 3F
  :0C98 3F 3F 3F 3F 3F 3F 3F 3F
  :0CA0 3F 3F 3F 3F 3F 3F 3F 3F
  :0CA8 3F 3F 3F 3F 3F 3F 3F 3F
  :0CB0 3F 3F 3F 3F 3F 3F 3F 3F
  :0CB8 3F 3F 3F 3F 3F 3F 3F 3F
  :0CC0 3F 3F 3F 3F 3F 3F 3F 3F
  :0CC8 3F 3F 3F 3F 3F 3F 3F 3F
  :0CD0 3F 3F 3F 3F 3F 3F 3F 3F
  :0CD8 3F 3F 3F 3F 3F 3F 3F 3F
  :0CE0 3F 3F 3F 3F 3F 3F 3F 3F
  :0CE8 3F 3F 3F 3F 3F 3F 3F 3F
  :0CF0 3F 3F 3F 3F 3F 3F 3F 3F
  :0CF8 3F 3F 3F 3F 3F 3F 3F 3F
```

Monitor Dump Of Song Table ↓

```
:0E00 20 40 30 10 00 20 48 36
:0E08 10 00 40 00 00 18 00 30
:0E10 00 00 22 00 10 00 00 1E
:0E18 00 40 00 00 18 00 20 00
:0E20 00 1A 00 20 44 32 1A 00
:0E28 20 44 32 20 00 20 4A 38
:0E30 20 00 40 48 36 1E 00 40
:0E38 44 32 26 00 20 40 30 28
:0E40 00 10 48 36 28 00 10 48
:0E48 36 1E 00 40 00 00 18 00
:0E50 40 00 00 10 00 40 00 00
:0E58 18 00 20 00 00 1A 00 20
:0E60 44 32 1A 00 20 44 32 20
:0E68 00 20 4A 38 20 00 40 48
:0E70 36 1E 00 40 44 32 26 00
:0E78 30 40 30 28 00 10 48 30
:0E80 28 00 20 40 28 28 00 20
:0E88 3A 22 28 00 40 3A 22 22
:0E90 00 40 3A 22 30 00 30 00
:0E98 00 2C 00 10 32 28 2C 00
:0EA0 30 34 2A 22 00 10 36 2C
:0EA8 22 00 30 2E 28 1E 00 10
:0EB0 28 00 1E 00 20 22 00 22
:0EB8 00 20 28 00 22 00 40 28
:0EC0 00 28 00 40 28 00 18 00
:0EC8 40 28 00 1A 00 40 28 00
:0ED0 1C 00 40 00 00 1E 00 40
:0ED8 00 00 1A 00 40 00 00 18
:0EE0 00 40 00 00 14 00 20 40
:0EE8 30 10 00 20 48 36 10 00
:0EF0 40 00 00 18 00 30 00 00
:0EF8 22 00 10 00 00 1E 00 40
:0F00 00 00 18 00 20 00 00 1A
:0F08 00 20 44 32 1A 00 20 44
:0F10 32 20 00 20 4A 38 20 00
:0F18 40 48 36 1E 00 40 44 32
:0F20 26 00 20 40 30 28 00 10
:0F28 48 36 28 00 10 48 36 1E
:0F30 00 40 00 00 18 00 40 00
:0F38 00 10 00 40 00 00 18 00
:0F40 20 00 00 1A 00 20 44 32
:0F48 1A 00 20 44 32 20 00 20
:0F50 4A 38 20 00 40 48 36 1E
:0F58 00 40 44 32 26 00 30 40
:0F60 30 28 00 10 48 30 28 00
:0F68 20 40 28 28 00 20 3A 22
:0F70 28 00 40 3A 22 22 00 40
:0F78 3A 22 30 00 30 00 00 2C
:0F80 00 10 32 28 2C 00 30 34
:0F88 2A 22 00 10 36 2C 22 00
:0F90 30 2E 28 1E 00 10 28 00
:0F98 1E 00 20 22 00 22 00 20
:0FA0 28 00 22 00 40 28 00 28
:0FA8 00 40 28 00 24 00 40 28
:0FB0 00 22 00 40 28 00 20 00
:0FB8 40 00 00 1E 00 40 00 00
:0FC0 1A 00 40 00 00 18 00 40
:0FC8 00 00 14 00 30 38 30 18
:0FD0 00 10 3E 38 18 00 20 48
:0FD8 3E 26 00 20 50 48 26 00
:0FE0 40 50 48 30 00 20 00 00
:0FE8 26 00 20 48 3E 26 00 20
:0FF0 48 3E 18 00 02 00 00 18
:0FF8 00 20 48 3E 18 00 20 48
:1000 3E 26 00 02 00 00 26 00
```

```
:1008 20 48 3E 26 00 40 3E 38
:1010 20 00 40 3E 38 18 00 30
:1018 36 2E 16 00 10 3C 36 16
:1020 00 20 46 3C 24 00 20 4E
:1028 46 24 00 40 4E 46 2E 00
:1030 20 00 00 24 00 20 46 3C
:1038 26 00 20 46 3C 16 00 02
:1040 00 00 16 00 20 46 3C 16
:1048 00 20 46 3C 24 00 02 00
:1050 00 24 00 20 46 3C 24 00
:1058 40 3C 36 1E 00 40 3C 36
:1060 16 00 30 34 2C 14 00 10
:1068 3A 34 14 00 20 44 3A 2C
:1070 00 20 4C 44 2C 00 40 4C
:1078 44 22 00 20 00 00 1C 00
:1080 20 44 3A 1C 00 20 44 3A
:1088 14 00 02 00 00 14 00 20
:1090 44 3A 14 00 20 44 3A 22
:1098 00 02 00 00 22 00 20 44
:10A0 3A 22 00 40 3A 34 1C 00
:10A8 40 3A 34 14 00 30 00 00
:10B0 00 00 10 1E 00 00 00 20
:10B8 26 00 1E 00 20 32 00 1E
:10C0 00 30 36 00 1E 00 10 3C
:10C8 00 1E 00 02 3C 00 00 00
:10D0 20 3E 00 1E 00 20 44 00
:10D8 1E 00 20 00 00 1E 00 20
:10E0 4E 00 1E 00 02 4E 00 00
:10E8 00 20 4E 00 1E 00 02 00
:10F0 00 1E 00 60 4E 00 1E 00
:10F8 02 4E 00 00 00 40 4E 00
:1100 1E 00 20 40 30 10 00 20
:1108 48 36 10 00 40 00 00 18
:1110 00 30 00 00 22 00 10 00
:1118 00 1E 00 40 00 00 18 00
:1120 20 00 00 1A 00 20 44 32
:1128 1A 00 20 44 32 20 00 20
:1130 4A 38 20 00 40 48 36 1E
:1138 00 40 44 32 26 00 20 40
:1140 30 28 00 10 48 36 28 00
:1148 10 48 36 1E 00 40 00 00
:1150 18 00 40 00 00 10 00 40
:1158 00 00 18 00 20 00 00 1A
:1160 00 20 44 32 1A 00 20 44
:1168 32 20 00 20 4A 38 20 00
:1170 40 48 36 1E 00 40 44 32
:1178 26 00 30 40 30 28 00 10
:1180 48 30 28 00 20 40 28 28
:1188 00 20 3A 22 28 00 40 3A
:1190 22 22 00 40 3A 22 30 00
:1198 30 00 00 2C 00 10 32 28
:11A0 2C 00 30 34 2A 22 00 10
:11A8 36 2C 22 00 30 2E 28 1E
:11B0 00 10 28 00 1E 00 20 22
:11B8 00 22 00 20 28 00 22 00
:11C0 30 28 00 28 00 02 28 00
:11C8 00 00 10 28 00 28 00 40
:11D0 28 00 24 00 40 28 00 22
:11D8 00 40 28 00 20 00 40 00
:11E0 00 1E 00 40 00 00 1A 00
:11E8 40 00 00 18 00 40 00 00
:11F0 14 00 40 38 30 18 26 40
:11F8 38 30 26 26 20 00 00 30
:1200 00 60 00 00 28 00 20 00
:1208 00 26 00 60 00 00 18 00
:1210 20 00 00 26 00 40 00 00
:1218 30 00 20 00 00 18 00 40
:1220 36 2E 16 24 30 36 2E 24
:1228 24 10 36 2E 28 24 30 00
:1230 00 2E 00 10 00 00 28 00
```

```
:1238 20 00 00 24 00 20 00 00
:1240 16 00 30 00 00 16 00 10
:1248 00 00 1E 00 30 00 00 24
:1250 00 40 00 00 2E 00 10 00
:1258 00 28 00 40 00 00 24 00
:1260 40 34 2C 14 22 30 34 2C
:1268 1C 22 10 34 2C 22 22 30
:1270 00 00 26 00 10 00 00 28
:1278 00 30 00 00 26 00 10 00
:1280 00 1E 00 30 00 00 22 00
:1288 10 00 00 1E 00 30 00 00
:1290 1C 00 10 00 00 22 00 40
:1298 00 00 26 00 30 00 00 36
:12A0 00 10 00 00 34 00 40 00
:12A8 00 36 00 40 00 00 1E 00
:12B0 02 00 00 00 00 40 00 00
:12B8 1E 00 30 00 00 2C 00 10
:12C0 00 00 28 00 30 00 00 26
:12C8 00 10 00 00 2C 00 40 00
:12D0 00 36 00 02 00 00 00 00
:12D8 40 00 00 36 00 40 00 00
:12E0 1E 00 20 40 30 10 00 20
:12E8 48 36 10 00 40 00 00 18
:12F0 00 30 00 00 22 00 10 00
:12F8 00 1E 00 40 00 00 18 00
:1300 20 00 00 1A 00 20 44 32
:1308 1A 00 20 44 32 20 00 20
:1310 4A 38 20 00 40 48 36 1E
:1318 00 40 44 32 26 00 20 40
:1320 30 28 00 10 48 36 28 00
:1328 10 48 36 1E 00 40 00 00
:1330 18 00 40 00 00 10 00 40
:1338 00 00 18 00 20 00 00 1A
:1340 00 20 44 32 1A 00 20 44
:1348 32 20 00 20 4A 38 20 00
:1350 40 48 36 1E 00 40 44 32
:1358 26 00 40 40 30 28 00 02
:1360 40 30 00 00 20 40 30 28
:1368 00 20 3A 22 28 00 40 3A
:1370 22 22 00 40 36 22 18 00
:1378 30 32 28 14 00 10 34 2A
:1380 14 00 02 34 2A 00 00 20
:1388 36 2C 14 00 20 2E 1E 14
:1390 00 30 2C 1E 1E 00 10 28
:1398 1E 1E 00 02 28 1E 00 00
:13A0 20 22 00 1E 00 20 28 00
:13A8 28 00 80 28 00 00 00 40
:13B0 00 00 00 00 C0 40 36 28
:13B8 30 00 00 00 00 00 00 00
```



If you wish to experiment with different waveforms, then you may change the second waveform with:

FOR I=0TO255:POKEI=3072,
31+31*SIN(I*pi/128):NEXTI

This will produce a full sine wave from 0 to 0 to be heard on voice 3. Other equations may be used to produce more complicated waveforms. Just experiment until you find the one you are looking for.

Conversions

PET

The conversions for this program to work on the PET are very easy:

USRPRT = $E84F
DDR = $E843

Directly after the variable declaration, instead of * = $0801, use * = $0401, followed by

.BYT $0C, $04, $0A, $00, $9E, $30, $31
.BYT $30, $33, $38, $00, $00, $00

to produce a line 10 SYS01038.

The only other changes are some deletions. They are the references to the SID chip and the screen. These are not applicable to the PET and so must be left out. The output from the converter can be fed through an amplifier to hear the sounds produced.

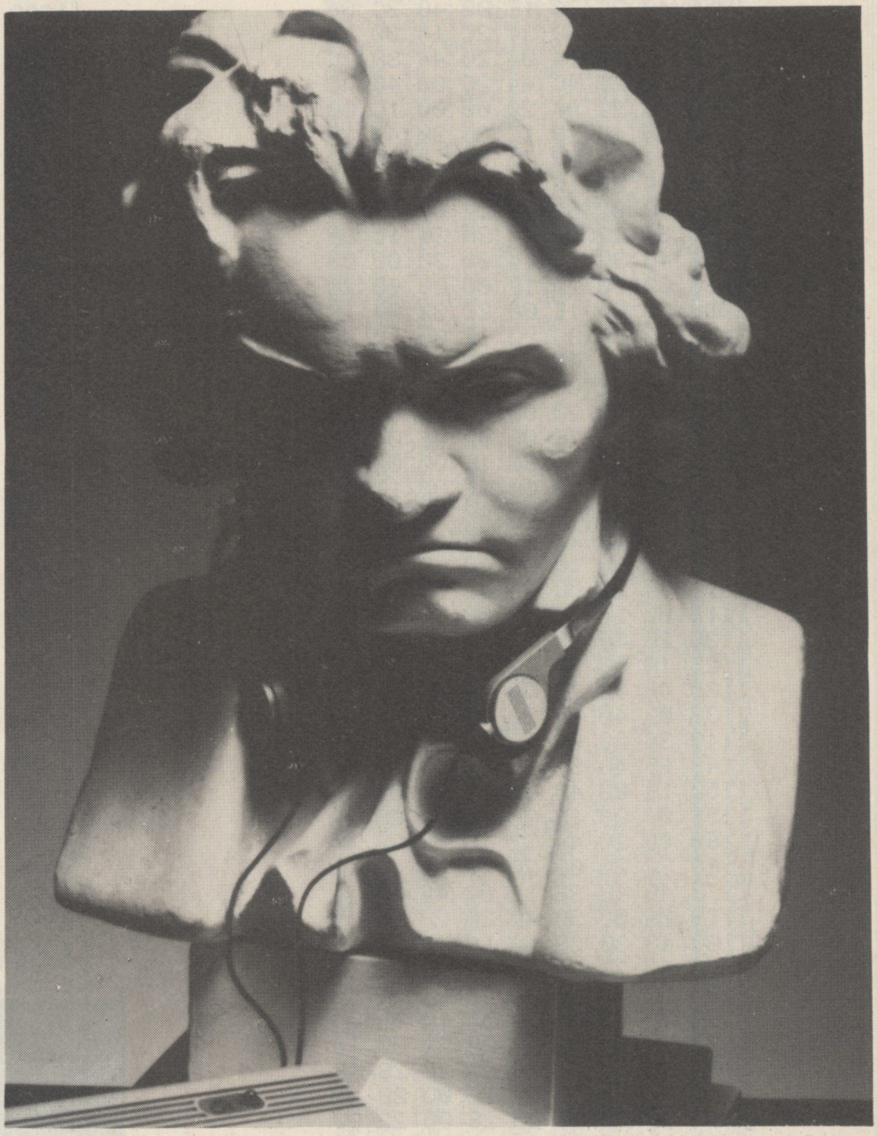
VIC-20

The conversions for the VIC are slightly more complicated. The points for changing to the PET must again be changed but to different values depending on the start of basic (the start of basic changes with memory expansion). As the start of basic is always above that of the 64, all of the locations of the different tables will also have to be changed so that they do not overlap with the program itself.

Acknowledgements

Hal Chamberlin for the original routines and theories behind this article.

If anybody would like more detailed information about producing music on microcomputers, the book 'Musical Applications Of Micro-processors' by Hal Chamberlin and published by Hayden is very good.



To enter the program requires some sort of assembler (the Commodore assembler for the 64 was used), and a good monitor for the 64. Do not use either of the monitors supplied with the Commodore assembler as they corrupt basic programs. The monitor used was a version of XMON.

Enter the program in the editor and then assemble and load (if no errors in assembling). Then enter the monitor and type in the three tables. When this has been done, save by .S"0:MUSIC.PROG",08,0801,13BA. Exit the monitor and type RUN.

The screen should go blank and the music should be heard through the speaker on the television. If this does not happen, check that the connections are correct at the back of the machine. If they are correct, check the machine code routine. When ready to try again, load MUSIC.PROG and then use the loader to load the assembly. Save in the same way.

BYTEWELL

Software Supermarket for your CBM 64

All the latest titles at SUPERmarket PRICES

ANIROG	3D TIME TRECK	£8.95
BUBBLE BUS	HUSTLER	£5.50
BYTEWELL	DEAD MAN'S GOLD (Adventure)	£8.50
BYTEWELL	THE ENCHANTED CHALICE (Also available for 16K VIC)	£8.00
CHANNEL 8	LANDER	£8.95
INTERCEPTOR	STARTRECK	£5.85
INTERCEPTOR	PANIC 64	£5.85
INTERCEPTOR	SCRAMBLE	£5.85
INTERCEPTOR	SPRITEMAN	£5.85
INTERCEPTOR	CRAZY KONG	£5.85
POSTERN	SHADOWFAX	£7.50
POSTERN	SNAKEPIT	£7.50
POSTERN	SIEGE	£7.50
LLAMASOFT	ATTACK OF THE MUTANT CAMELS	£6.65
LLAMASOFT	MATRIX	£6.65
LLAMASOFT	GRIDRUNNER	£5.00
LLAMASOFT	LAZERZONE	£6.65
BYTEWEAR	SUPERFILE	£12.95

THE FABULOUS COMMODORE 64 COMPUTER OUR PRICE
ONLY **£198.95** (inc. VAT and carriage)

WE ALSO STOCK HUNDREDS OF PROGRAMS FOR YOUR VIC 20
Please write for free lists.

MAKE SURE OF YOUR CBM 64 THIS XMAS. DON'T LEAVE IT TOO LATE AND THE 'SOLD OUT' SIGNS APPEAR.
ORDER NOW AND HAVE YOUR MACHINE DELIVERED IN TIME FOR THAT SPECIAL XMAS PRESENT.
A DEPOSIT OF £30 WILL SECURE YOUR MACHINE.
EITHER PAY THE BALANCE BY 1st DEC. OR MAKE 3 PAYMENTS OF £56.32 BY THE 1st DECEMBER AND YOUR MACHINE WILL BE DELIVERED TO YOUR DOOR BEFORE THE MAGIC DAY.
WE ALSO STOCK HUNDREDS OF TITLES FOR THE SPECTRUM ZX81, ORIC, BBC, DRAGON.
Full lists on request.

WOULD YOU LIKE TO EARN EXTRA MONEY SELLING. MICRO-COMPUTER SOFTWARE TO YOUR FRIENDS AND WORKMATES?
BYTEWELL REQUIRES AGENTS IN ALL AREAS. IF YOU ARE INTERESTED THEN WRITE OR CALL NOW. GOOD COMMISSION PAID.

POSTAGE. 1 CASSETTE 50p. 2 CASSETTES 60p.
3 OR MORE POST FREE.
Please make cheques/P.O.'s payable to BYTEWELL.
Overseas Orders please include 60p P&P.
Bytewell, 203 Court Road, Barry,
S. Glamorgan CF6 7EW. Telephone
(0446) 742491

TERMINAL SOFTWARE

Terminal Software are FIRST with a Commodore 64 games cassette that has SIMULTANEOUS two- player action: SUPER DOGFIGHT. Our SUPER SKRAMBLE and SUPER GRIDDER have already set a standard for 64 games that other manufacturers find hard to equal. There are more on the way...Rec. Prices £9.95

VIC 20 owners now have a chance to enjoy a games cassette that makes unsurpassed use of the VIC's graphics: PINBALL WIZARD from Terminal Software is a wonder of simulation for the UNEXPANDED VIC 20...Rec. Price £7.95.

There are ELEVEN more games for the VIC 20 from Terminal Software.
Terminal make excellent programs for other manufacturers' machines too...

NOW AVAILABLE IN

Dixons SOFTWARE EXPRESS

Greenchip THE DISCOUNT COMPUTER AND VIDEO GAMES CLUB at DEBENHAMS

SELECTED BRANCHES OF LASKYS

TERMINAL

PRINCIPAL WHOLESALE DISTRIBUTORS
U.K.: PCS, Blackburn. Centresoft, West Midlands. Soft Shop, London.
Europe: Tial Trading, Nr. Malmo, Sweden. Aashima Trading, Rotterdam.
Wico-Soft, Dusseldorf. Delta Computer Systems, Thessaloniki.
Infalogs, Marseille. **New Zealand:** Alpine Computing, Auckland.
Australia: Vicwest Software Services, Perth.

TERMINAL SOFTWARE
28 CHURCH LANE, PRESTWICH, MANCHESTER M25 5AJ.
TEL 061 773 9313

SOFTWARE REVIEW

Making Music with Composer

I suppose that most traditional composers would not relish the thought of having their overtures copied onto the VIC 20 and who can blame them. The present state of the art technology means that micro music is left somewhere between the violin and an electronic organ although this does not mean to say that good computer music can come out of micro's like the VIC although like anything else it needs a little care and practice.

Many programmers need to have some form of composer on which to write their introductory and final pieces of music that accompany their games, business programs and word processors if only to put the finishing touches to their 'user-friendly' packages and one musical item they should not overlook is a package called Composer from Marketing Micro Software.

Getting Started

Even if you know nothing about music, all you have to do with Composer is play about with some notes for a while and something will sound just right. Designed for the unexpanded VIC, once the cassette has been loaded you are confronted with a series of lines which form the musical staves at the bottom of which is a little arrow to inform you of where the next note will fall. Each note is entered by pressing numbers one to nine on the keyboard. Once you have entered the first note you will, at first, find that the cursor will not progress. This is not a fault of the machine, merely the way the program has been written. This is a little annoying but you can save yourself the effort by pressing A which enables the cursor to move automatically and means that you can hear the note as soon as it is entered without having to go back to the beginning of the stave and listening to the whole sequence. Whilst on the subject of notes, it would be helpful if the screen display included some form of note guide ie what key to press to get a required note. Sadly, this is missing.

Any piece of music would sound incredibly monotonous if it did not have any variation in tone. The user is saved from this because Composer has both high and low registers which can be obtained by entering either a + or a − sign and along with this there is the ability to include whole notes (semibreves), half notes (minims), quarter notes (crotchets) and eighth notes (quavers). Unless you want to experiment with the length of the note and the duration of the note there is no other way of actually slowing the piece of music down.

COMPOSER
Unexpanded VIC-20

Note Length

On the VIC, note length is determined by the right key pressed which is representative of the four notes in the program. For example, pressing W gives you a whole note and Q a quarter note although the actual difference between the lengths is hardly noticeable. The duration of any note can only be increased by the set maximum of 50% and this is done by inserting a full stop after the appropriate note.

From a musical point of view, all that remains to be explained on this program is the inclusion of sharps and flats which, for the uninitiated, is the difference in sound between two different notes. On a normal music sheet, some keys would require a shorter distance between notes, this interval being known as a semi-tone. On a sheet of music these semi-tones are represented by a # for a sharp and a b for a flat. However the VIC 20 was not built to represent a music sheet and this is where some confusion may arise.

The screen will not show flats. Therefore the flat sign is represented by the sharp sign which is slightly confusing and so if you want to represent a B flat it must be shown as an A sharp which is even more confusing.

Once you have reached the end of the stave, then that is it. Of course, for an unexpanded VIC there is no scroll and this would be very useful in the event of any further versions of the Composer because then you could carry on almost to your heart's content. As it stands, you can't. So now there are two choices. You can either wipe the tune off the screen or store it onto cassette, but before you do any of these it would be an idea to hear what you have writen from the beginning and it is here that you need to make use of the function keys.

Using the Function Keys

For a brief explanation of what they are used for in this program, F1 enables you to play the note in the present position and F7 means that you can play the sequence up to the position of the cursor. Should you press F5, you will find that the tune will be repeated ad infinitum until some other key is pressed. Probably the most interesting and amusing of the function keys is F3 which allows you to change the voice.

There are four of these voices and the worst of these is definitely the lowest tone. There is no musical quality in this one whatsoever as it sounds like a car without any tyres doing 20mph on the hard shoulder of the M1. It would also be very nice to be able to change the voice whilst the tune is being played back. This is also missing.

Conclusion

Having said this, it is worthwhile bearing in mind that all programs have their limitations and defects and Composer is no exception. As a bit of fun it's enjoyable but anybody who is in the advanced stages of making music on the micro might like to try something else.

Product:	*Composer*
Area:	*Music*
Price:	*£11.50.*
Configuration:	*VIC 20, datasette, monitor or TV screen*
Company:	*Marketing Micro Software Ltd*
Address:	Goddard Road, Whitehouse, Industrial Estate, Ipswich, Suffolk IP1 5NP
Telephone:	*0473 462721*

Vicpak-1

There are two more packages for the VIC from MMS, these being Practicalc Plus and Vicpak-1.

Once more, Vicpak-1 is for the unexpanded VIC 20. There is a collection of seven programs on this cassette, these being Mortgage, Elements, Statistics, Calendar, Marblestat, Expectancy and U-Draw. Of these only three or four are any good without being outstanding and the remainder really are not worth bothering with. The standard is set by the first program, Mortgage and the professional edge to the product was blunted by the fact that there is a noticeable lack of formatting and this is something which is consistent throughout. Mortgage is pretty self-explanatory and as this has a real practical use for would-be home owners, this is one of the better programs. All you have to do is read the instructions and enter the necessary data. The program is designed to find the unknown variable for the principal, monthly payment, term of and annual interest of the mortgage loan.

The unknown factor is represented by a 0 although this is something you do not need to enter because as long as you enter all the relevant facts and just need to know the total interest payable, then this program will happily do it for you. Following on from this, there is the ammortization table which informs the potential borrower of the actual amount per month that goes for interest.

However, there are two factors worth noting here. First of all, all the calculations are performed in terms of dollars rather than pounds and any conversion has to be done mentally or on a calculator. Secondly, part of the screen is reversed out on a black background and you need to squint a little bit to read what appears on the screen.

Know Your Chemistry

Elements is the next program which takes the form of a chemistry quiz. The manufacturers say that this rather simplified form of quiz (they call it Computer Aided Instruction – CAI) "may someday be an important part of education". This could be true as long as the technical errors are ironed out first. For instance, the chemical symbol for cobalt is co, right? Wrong!! According to Elements the correct answer is Co.

For each question the user gets 10 seconds to reply and if you get it right, up pops a friendly message like "Great", "Cool" or "Right on!" Should your time elapse or you get the answer wrong then you get moved on to the next question. After every 10 questions, a list is displayed which details how many were right, wrong and the time that has elapsed since the beginning. This program is fun up to a point, especially when you are confronted with elements like beryllium which you have never heard of, but after a short while it becomes rather tiresome.

Statistics transform the computer into a calculator although all you can do with this is calculate the total, mean, standard deviation and standard error of a series of numbers. For example, entering the values 4567, 9999, 3 and .5 leaves a total of 14569.5, a mean of 3642.375, a standard deviation of 4752.89094 and a standard error of 2376.44547. That is the sum total of this program's capabilities and its limitations should speak for themselves.

In the Beginning

If you ever want a calendar that, ideally, should last for a lifetime, then Calendar is a capable program as this produces a monthly guide from 0 BC to 9999 AD although this is of course based on the Julian Calendar. The only data to be entered here is the year and month, say 1961 and 3. As a display of the capabilities of the micro this is a nice example although there are better ways of doing it. How about some form of game?

Marblestat is an example of the graphic capabilities, in this case dropping marbles down a chute and diverting them to the left or right of a series of pegs. There is a 50/50 chance of the marble going either way at each peg until it reaches the slot and when that happens the number of marbles to reach that slot (of which there can be ten) goes up by one. It is a bit like the old fairground game called Throw-a-penny except for the fact that the amount of marbles in a slot can be represented on a bar chart. As a representation of the computer's capabilities this program holds a slight, but only slight, advantage over Calendar due to the fact that the user can alter the speed of the marble going down the chute. A word of warning here: if the speed is too slow, you are kept waiting for what seems like ages for something to happen. Be careful – you might go to sleep!

Expectancy is one of the better programs because, if you are truthful in your answers, you get a rough value for life expectancy and what percentage of the population you are expected to outlive. You can 'fool' the program however by saying that you are over 70 years old and 'fixing' the answers so that you have a life expectancy of, for example, 53. Another interesting aspect to this program is that you can use it to see how life expectancy increases or decreases as social factors and personal habits change. To the credit of the manufacturers, they recognise that this program has an 'unreal' quality about it and it is not a fortune teller or a substitute for a physician and should not be used as such. Most of the questions asked are quite personal, the one that comes immediately to mind is, in the case of a female, how often you visit the gynaecologist. However, anybody worried about privacy should be comforted by the fact that you can fool the program and because it is for use with a home computer the results are essentially private anyway.

Graphics

The final program on this cassette looks at first as if it has got very little to offer. This is called U-Draw and it is not until you actually get well into the program that you realise it has a few nice tricks up its sleeve although you can not draw perfect curves on the screen. This is because the pictures, which are drawn using the cursor as the pen, are built up of solid blocks, dots, dashes and various other symbols on the keyboard, each of which can be represented in up to eight different colours.

The program operates in two modes, draw and letter. It is the latter mode which types the symbol on the key, whilst the draw mode makes use of the blocks, dashes and dots. One of the tricks this program contains is the fact that either mode has the option to create a continuous line manually or by moving the cursor using the skip key to two different positions and pressing the P at both of the different locations. Secondly, using the function keys, any picture can be stored on tape. There is of course the ability to erase any section of the picture.

There are some good programs on this cassette but it is unfortunate that the quality of the programming and sometimes the contents is rarely better than average. Add to this the fact that the flip-side of the cassette has the same programs on it and costs £11.50.

Practicalc on the 20

PractiCalc is the third package from MMS for the 64 and the VIC 20 and this time the machine requires 16K expansion, cassette or disk drive as well as a monitor or television set.

It is a spreadsheet program, operating with both letters and digits, and is mainly suited home use and for small businesses with 25 employees or less. It comes either on a tape or disk and apart from the differences involved in loading, no other alterations need to be made when operating the program.

The starting format is made up of 30 rows and 15 columns, although this layout can be altered at any time during its use simply by changing these numbers. It has a maximum and minimum number of rows – 200 and 1 respectively with 100 and 1 for the columns, thus providing enough room for 600 items of data (2,000 for the 64). One item occupies each cell and the latter, is the location on the spreadsheet.

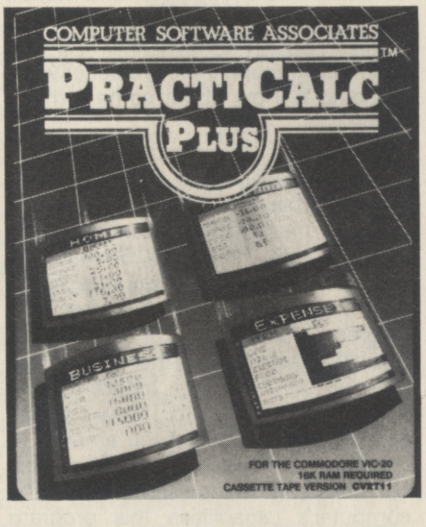
Changing screen format

Whatever your choice for the dimensions are at this stage, there is still room for change. Upon loading, each column has a character length of seven characters which is often not long enough for the type of information you may need to enter. There are a few unique features of PractiCalc, concerned with holding and enlarging individual parts of the columns and rows. The character capacity of all the columns can be individually altered to a maximum of 21 using the F3 key and then the G. Also one column can be titled and left on the screen while surrounding data is removed and similarly, the program can hold individual column and row headings. Other functions included in this program are sorting, searching, seeking, and replication. One other change worth noting, regarding the dimensions of the spreadsheet is the deletion of a column or row, which again makes use of F3.

This is not a menu driven program. Everything is controlled by the use of two cursors (one of which is a checked square and the other a light blue oblong both is unlike any cursor, because once they reach the end of the screen they do not automatically descend to the next) and the function keys. Although you may have positioned the cursor correctly on the spreadsheet, data will first appear at the top of the screen on the data line. It would be much better to see the data entered at the chosen cell as it is typed in, rather than having to press return every time, although these two operations are very simple.

Any item of data that is entered, is either a value such as a number or the location of a number, viable for mathematical operations or a label which does not have a numeric value. To further differentiate between the two, values appear against the right hand side of the column and labels against the left.

Several mathematical functions affect the values, for instance addition, subtraction, multiplication, division and exponenation. The 'less than', 'greater than' and 'equal to' signs are also applicable. As well as these, there are other major mathematical operations, for instance; finding the average, absolute and minimum values in a range of numbers and the logarithm and square root of a number. To perform any calculation the correct equation has to be used. For example to find the square root of 81, the required formula is SQR(81), whilst the formula for an average is, depending on the area to be calculated, AVG(A1.A6) and this must be preceded by the F1 key. PractiCalc also has the ability to alpha sort, numeric sort and can print out lists of formulae independent of the rest of the spreadsheet.



There are still several interesting ideas that need to be discovered and the F3 key is the key that will activate these. Any depression of the key results in a series of characters appearing at the top of the screen. Information in individual cells can be erased in two ways. The first, is simply to type over information that has already been entered and the other, is to use the B key to clear the contents of the cell.

It does not matter if the information has been stored on the disk or the cassette, a hard copy of the data can be printed out. To use the PRINT command, the cursor is positioned in the left hand corner of the area to be dumped out. The co-ordinates of the position where the print out is to end, have to be typed in the right hand corner. The printing capacity is 80 characters per row and the columns printed out will be the same size as those shown on the screen. Any escape from execution of the functions is provided by F7. On the graphics capabilities of PractiCalc, there is a lot to be desired. Graphic representation is either in low-res, (a series of asterisks) or hi-res for the bar chart. Note that in either mode it may be necessary to alter the width of the column because the quantities represented may exceed column width resulting in an error. If anything is wrong, error messages appear all over the screen, but the data is not lost as with some other comparable packages.

Out of all the latest software for the VC produced by MMS, this is definitely the best one and gives a good service for the money.

Product:	*PractiCalc*
Area:	*Business*
Price:	*Cassette for the 64, £39.95. Disk for the 64, £44.50. Cassette for the VIC 20, £29.95. Disk for the VIC 20, £34.50.*
Configuration:	*VIC or 64, disk drive, printer and monitor.*
Company:	*Marketing Micro Software Ltd*
Address:	*Goddard Road, Whitehouse Industrial Estate, Ipswich, Suffolk IP1 5NP*
Telephone:	*0473 462721*

"*practically speaking...*

Machines:
Commodore 64 · VIC 16K · CBM 8000/4000/3000

Programs:

DFM Database
Fully User-definable
Up to 15 fields per Record
Search & Sort on any Field
Select/View/Print/Calculate
Report Generator

DFM Mail Labels
Reads Database Files
Resort/Select to User's specification

DFM Wordflow (coming soon £19.50)
Word processor to link with Database

Catalog
Libary Filing System
36 Element Records
Cross-referencing
Search/Sort/View/Print

Datalog
Professional/Academic Notebook
Definable 4 Index Reference
Re-orderable 8 Line Text
Replicate & Update
Search/Sort/View/Print

Journal
Financial Diary
Calendar
Re-organise Agenda
Replicate Entries
ID File Recognition
Search with Totals
Monthly Reports

Notes:
Prices include P&P and VAT
All programs are disk and tape compatible, easy to use and supplied with documentation.
Registered Users receive regular notification of all new programs and updates.
Fax sheets available on request.

Please supply for : Computer Model ....
: Disc drive type ....
: Tape (tick) ☐

Copies	Programs	Price	Value
	DFM Database	**£24.00**	
	DFM Mail Labels	**£10.00**	
	Journal	**£19.50**	
	Datalog	**£19.50**	
	Catalog	**£16.50**	

I enclose a cheque/PO to the value of £

Name: ....

Address: ....

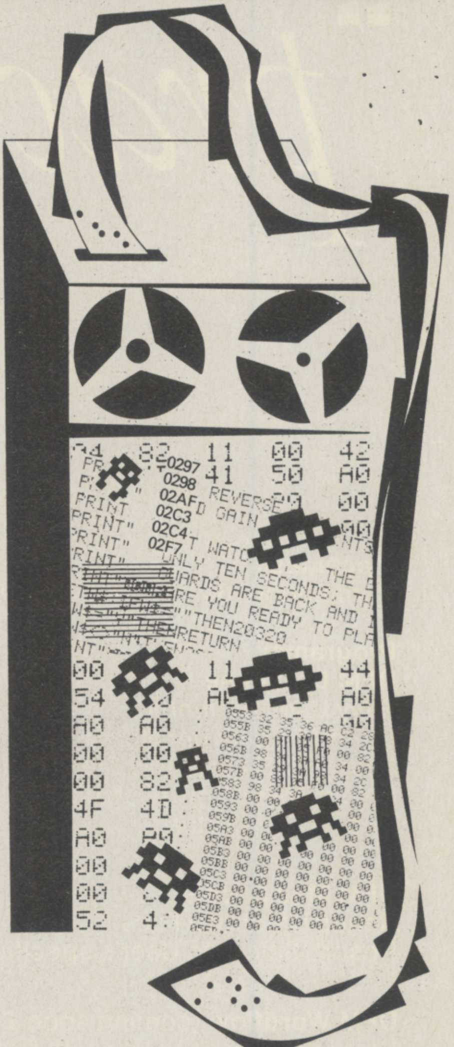
....

c/c Please send me details of your programs (tick) ☐

"*dialog...*

Dialog Software
19 Short's Gardens, London WC2H 9AT
Or phone 01-289 6904 for information/Access & VISA orders.

SOFTWARE REVIEW



Commodore Assembler

Commodore have recently launched an Assembler for the 64. Here, Kevin Bergin puts it to the test and finds out if it comes up to scratch. As well as this, there is also the Super Screen from Audiogenic, and a game of pool from The Computer Room.

DOS Support

To load the DOS program LOAD"DOS WEDGE64,"8 press return this program is a Boot for the DOS 5.1 and will load it and enable the DOS support program. Once loaded there are many commands available to the user, most of them similar to Basic 4 disk commands. We will have a brief look at the commands available. The @ symbol will return the current disk status. The symbol @$ followed by a drive number where applicable will list the directory of the disk and as on the Basic 4, the directory is invisible and will not disturb any program in memory. To a new disk, enter @N(drive): diskname,id. To load a program the format is/filename, to load a program back into the area it was saved from %filename, to load and run a Basic program the upp arrow.

Some of the other commands available in the DOS program are rename, copy and scratch. The program is very useful to have in the 64 even if the Assembler package is not being used. This is a highly efficient program and works extremely well thus saving a lot of the users time and energy.

The Editor

The Editor64 program is based very much on Commodore's package for the Pet. It allows the user to write in a Basic style the Source file(s), although it should be noted that any Basic programs executed whilst the Editor is enabled will not funtion. To load the Editor enter LOAD"editor64,"8.1 to enable the editor enter SYS(49152). To load previously saved source files, use the GET"filename" command and to save files use the put"filename" command. The source files can also be listed in the usual way and renumber there is also an AUTO command to save typing in every line number. There are some printer commands like SKIP and PAGE, to exit the editor enter KILL.

The Assembler

The Assembler is also similar to the Pet version. It is loaded in the usual way then run. When the assembler has been executed, an object filename is requested, this is the name to be given to the output file. Then an option of hardcopy is given and the next request is for a cross reference, finally the user is asked to input the name of the source file. The assembler makes two passes and gives an error count as well as displaying any errors, a symbol table is created and the object file is put onto disk under the name specified by the user. If a cross reference file was chosen then this is also output to the disk.

The Marco

Having never used a Marco before this was rather difficult to write about, but basically it is a shorthand form of assembly language. Marcos take the following form:

```
(label) .MAC macro name
        TEXT OF MACRO
(label) .MND
```

The directive .MAC defines a Macro and creates up to nine parameters. The directive .MND declares the end of a Macro. To call a Macro give the Macro name and the parameters. Macros may be nested with a limit of up to eight Macros.

This particular package comes with two Monitors one which resides at $8000 (hex) and one at $C000. The monitors are loaded thus; LOAD"MONITOR$8000",8,1 (or$C000) and are entered with; SYS 32768 (for the $8000), SYS 49152 (for the $C000). After entering the monitor the registers are displayed and a period is to the left of the cursor, this is a user prompt. The purpose of the monitor is to save the final code of your assembly language programs and to edit and check Machine Code.

Monitor Commands

The Monitor supports the following commands; A to assemble code. The format is; A (address)(opcode mnemonic)(operand), e.g.

```
A 7000 LDA #$00
```

If there is an error in the line to be assembled a '?' will be printed, but if there are no errors the next legal line for entry will be displayed ready for an entry. Thus avoiding the need to repeatedly type A for assemble. The command D will dissassemble Machine Code into assembly language. The format for the Disassemble command is ; D (hex address) (hex address), this will disassemble from the start address to the end address. The end address is optional as the following lines can be displayed by scrolling the screen with the cursor keys. The screen editor can be used to make any alterations to the Code, as it can be used to make alterations with the Assemble command.

Within the monitor there is an execution command; G (go) will begin execution of a Machine Code program at the given address, thus the format is, G (hex address). There is a LOAD and SAVE command within the monitor. The format for the Load command is; L"filename", (two digit device number). The format for Save is; S"filename", (two digit device number), (start hex address), (end hex address). The Load command always loads the program back into the same part of memory.

There are many more Monitor commands, they include M to display memory, R for register display T to transfer locations, H to hunt memory and many others. The cross reference program may be chosen when using the Assembler, if the user does choose to use the cross reference program two files will be created on disk. The new way to examine the cross reference files is; LOAD"CROSSREF64",8. Once the program has loaded, Run it. The program gives the user a choice of a hard copy or screen a display.

Loaders

There are also two loaders in this package a HILOADER and a LOLOADER. These are used to load the assembled code into the area they where written in or into an 'offset' address and create hex code. Thus is the final version of a program and is then saved using one of the monitors mentioned earlier. The loaders are loaded thus; LOAD"filename",8,1.

Conclusion

The conclusion for this package must be; can anyone do better?? It would be hard to beat the high standard Commodore have risen to in producing this package. There are very few packages that one can buy that are well documented and live up to the user's expectations and programming needs. Even though part of the package is taken from the one for the Pet's, a lot has been added and it comes only as a bonus that the two packages will be in some ways compatible. We look forward to seeing this high standard repeated by Commodore and also followed by other Software houses.

Dams For The 64 And The Vic

The Dams Business Computers Ltd, IEEE cartridge for the Vic and for the 64 comes with very little documentation, although the piece of A4 given for this review does refer the user to the 64 programmers reference guide!!

The IEEE cartridge is an interface between either the VIC20 or the 64 and the IEEE bus allowing the Vic or the 64 to use devices such as a disk drive or a printer, or even a great number of Vic's or 64's using one drive (although this was not tried).

Memory

The memory on the unexpanded VIC did not appear to be affected by the IEEE cartridge although it was not tested using an expanded VIC. On the other hand the 64 version places its code from $C000 – $CFFF hex, this could be very inconvenient and Dams supply no information on what to do with programs that occupy this area of RAM. For instance it is possible to relocate the code if it conflicts with other Software.

The Cartridge

The cartridge for the Vic is a standard white plastic cartridge with the circuit board protruding at the rear to connect to your peripherals. This was a most satisfactory arrangement for the Vic, but on the 64 the connector board simply seems to have been extended and reshaped to fit the expansion port leaving the cartridge hanging around in mid air. Surely a little less cost saving could have been done to make the cartridge secure. On the review copies there was no screw in the centre of the cartridge to hold the casing and the board together.

Testing

On both machines the IEEE cartridge has the effect when in place. On power up it displays the message 'DAMS IEEE CARTRIDGE' and apart from that there is no evidence of the cartridge being present and the user has access to any of the desired peripherals.

Conclusion

The cartridge works very well and is obviously extremely useful, there is obviously not much need for documentation, but there are some nagging questions that should have been answered. On the whole it is well worth buying at £57.44 and comes highly recommended, even higher if Dams supply the missing documentation.

Super Screen For The Vic

Super Screen from Audiogenic costing £9.95, converts the Vic into a 40 column by 24 line screen. The program comes on cassette and is supplied with a demo program, which basically takes the user through some of the possible uses of a 40 column Vic.

Not Completely Compatible

Audiogenic say that is is not possible to POKE screen and colour locations, whilst this is so, the screen colours can still be changed in the usual way. Also the RUN STOP/RESTORE keys are completely disabled during the program operation.

Expansion

This package requires at least 8K expansion in order to use it. With 8K expansion in place, the user is left with only 5K RAM with which to run programs on.

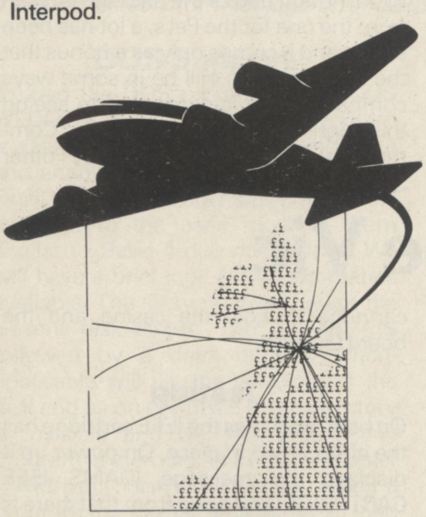
Conclusion

This is certainly a welcome package seeming to operate every bit as well as the 40 column cards that are available for the Vic. It is also Soft loaded and therefore more flexible and cheaper. The 40 column Vic is limited to certain types of applications, such as business and education or writing. Nevertheless as most of us with Vics tend to require the Vic for these uses it is well worth adding to your collection at some time.

High flier for the 64

High Flier is from Commodore and is described by them as 'an extended business management game for the 64'. Commodore give some parameters for the game.

Amongst these are the following main points. To simulate the building and running of a small airline after World War II. To provide a challenging game based on facts and to present it in a graphically pleasing format. The game is disk based and Commodore also specify that a 1541 drive is essential, but the game also works using a 4040 via Interpod.



Starting

High Flier is loaded by typing LOAD"HIGH FLIER",8,1 (then press return), then type RUN (press return). The screen will fill with an attractive display in large letters, the large letters are simply done using the PRINT statement, it is worth taking a look at the way Commodore have achieved this. The message loading will also appear, and the rest of the files are loaded from disk, when this has finished the player is asked whether or not they are continuing a previous game. Obviously first time round the answer is no. It is a nice touch to be able to stop and save the game, although for a game such as this it is probably necessary as it could take up many valuable hours.

On starting the game you are given your financial status and the option of buying a plane. This is necessary to be able to continue, as without a plane one cannot fly! The player is then again given their financial status and the screen changes to a partial map of the world, with the players plane in Heathrow approximately. There are also two windows at the top left and bottom left of the screen. These hold the current status (bottom) and the options available (top). The player may refuel, takeoff, finish or go into auto. Selecting an auto flight will do everything for you, but be sure that you have enough moves to go to the airport you require. The bottom window contains the type of plane and the load it is carrying (i.e. passengers or cargo).

Flying

After choosing one of the above options the bottom screen gives you a list of the airports available. Each plane you own is given a 91 day plan which the player maps out and terminates by pressing 'F'. The program then works out the actual flying time and the overheads including; fuel, landing, wages and admin. The player is then given the profit or loss on the 91 days and an option to update one of several services. Built into the game are several screens with options built into them, at any one time you may only choose one option. Commodore say in the accompanying manual that this is to simulate the real world.

After each flight plan has finished the player may update one of the airport services, visit the bank to borrow or repay, sell one of their aircraft and buy another aircraft. There is also at the start of each year (as far as the game's concerned), an option to set the rate of exchange for the year followig and to set the cargo/passenger ratio for your airline. All of these factors are taken into account when a flight pattern is being calculated, therefore one should be extremely careful when altering them.

Conclusion

The manual supplied is not very long, but it is easy to follow and seems adequate enough for the game. This is not an easy game and it can be very frustrating as one must remember all of the factors before taking decisions. The game costs £14.95 and will be available from Commodore Business Machines, as from July.

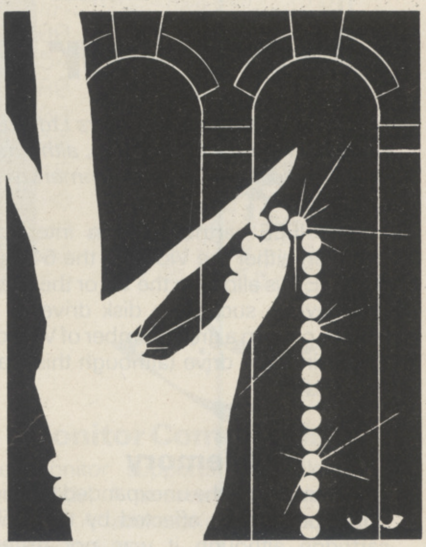
Telengard

Written by Microcomputer Games, a division of the Avalon Hill Games Co., this game is a strategy/adventure game on the lines of the board game of 'Dungeons & Dragons'. As with all of their programs, it comes in a nice big box that is clearly marked as to which machines the cassette is for (there are four versions for four different machines) and a very comprehensive instruction manual to go with the game.

From the packaging, it looks as though it is a good game but let's take a look at the game itself. The first thing to do is to position the tape at the start of the 64 version, on the second side, the tape has therefore to be rewound. It is then just a matter of loading the game and running it. This again took a long time before the game was finally loaded.

Loading was in two stages, and when run, I was asked if I would like to start a new character or to continue with one saved on tape. As I had not played it before, I asked to start a new character. A list of character attributes was displayed on the screen and return was required to choose that character. I chose my character and entered the dungeon.

When in the dungeon, the object is to collect as many treasures as possible as well as kill all unfriendly monsters that you come across. There are friendly inns that you can visit but they are only accessible from the first level down in the dungeons and it becomes very difficult to find these inns as you move further down the levels.



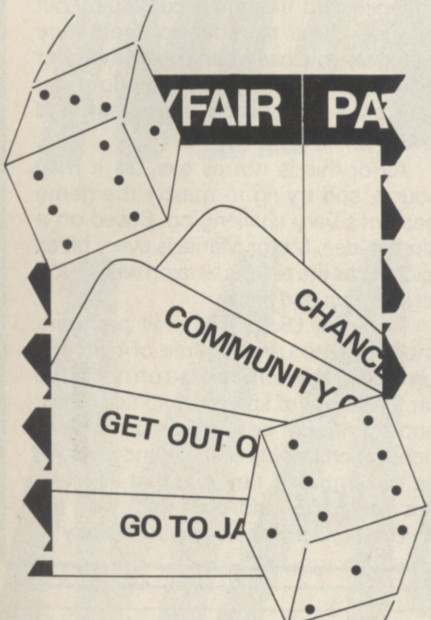
The ability of the character is assertained by the experience points that the character has gained and the experience points directly affect the level of the player and how many spells the character may use. If you can last the first few minutes of play, which is where I was killed most times, the monsters begin to get more powerful and also the deeper into the dungeon the more powerful. The way down further into the dungeon is by teleport, pits, or stairs. The stairs go in only one direction and can be seen, but the other methods are hidden from the player until it is too late.

How long the player lasts is determined by the number of hit points left. When all hit points have gone, the player dies.

The only bad part about the game is that when the player is dead, instead of telling the player how well, or how badly, he did, the program just asks if another game is required.

To say all about this game would take up most of this magazine, but simply it is a very good game which is very addictive and lots of fun. The programmers have made full use of the abilities of the 64, using Sprites, user defined characters, colour, and sound to great effect.

At £23 it is still one for my collection and I think that all will feel the same.



Monopole for the 64

A recent game from Rabbit Software. Unlike some of their recent games for the VIC Monopole is original, although it is based on the familiar board game. Monopole is written in Basic, but you would never have guessed from the way it performs. I experienced no problems in loading or playing the game. The loading did take a few minutes as it is on cassette, but the wait was worth while. There are no instructions nor are any needed. When you run the game you are greeted with the Monopole board as those of you who have played the board version will remember it. The difference being the colour, sound and graphics. The financial status is given and the dice are in the middle of the board. The players (only two are allowed) need to roll the dice to decide who plays first, each player is given a turn and the highest starts the game.

The rules are the same as for Monopoly. When landing on a property you may buy if it is unsold or else pay rent according to the property and houses or hotels on them. The computer records each players financial and property status. At any time the player can hit the 'T' key which gives you a menu of the options available. Some of the options are: build, review, list and mortgage.

If a player lands in jail to get out you must have a 'get out of jail' card, pay £50 or throw a double within three turns. If on the third throw the player has not got a double or one of the above options then the £50 must be paid. The programmers obviously knew the game well; they even remembered to include some of the lesser known rules like throwing three doubles lands you in the slammer! Siren shrieks.

The game is written to the standard of a good business package. It makes use of all the facilities available on the 64: graphics, colour, memory and sound (a siren shrieks if you land in jail) are used cleverly, for example during the board display when a player chooses options from the various menus. The screen and border colours are coordinated with the menu choice.

There is a lot more to be said in praise of Monopole but I'll leave it to readers to discover the rest. The game is priced at £9.99 and is well worth it, not only for the chance it gives to see what can be done with the 64, but also for the hours of enjoyment it offers.

Hustler for the 64

Hustler is a pool game for the 64, by Bubble Bus, The Computer Room, 87, High Street, Tonbridge, Kent TN9 1RX. The game comes on cassette and is loaded by pressing SHIFT and RUN STOP. When the game is first run there is the usual Title and author display, (nicely done in this case) there is also a tune played, the Hustler. This is very well programmed and makes a pleasant change from the usual zap pow sounds.

Levels

At the outset of the game there is a choice of six levels or six different games of pool. To start the game the player chooses a level. The game is played with a joystick or keys. The player's cue is represented by a cross and is moved to the appropriate position before shooting. The four function keys move the cue up, down, left and right, the space bar shoots. The game may be aborted at any time by pressing restore, this causes the game to restart.

Playing

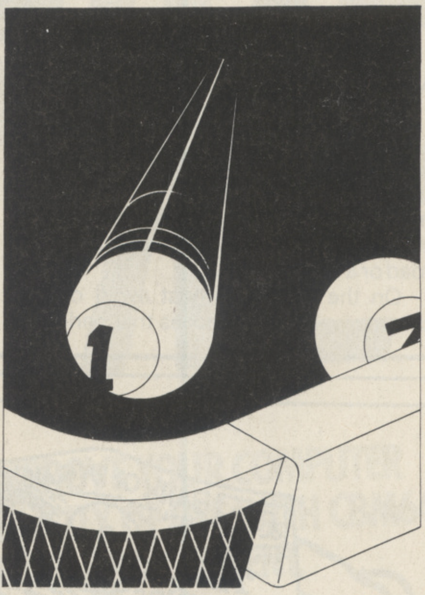
The levels of play are:-

1. One player – any ball in any pocket.
2. One player – balls in order.
3. One player – ball in its pocket.
4. Two players – score for each pocket.
5. Two players – mini pool.
6. Two players – lowest and highest.

As well as these six levels there are also two more options (7 and 8). Option seven returns a table of current high scores and option eight ends the game.

Conclusion

This is another gem in what seems to be an increasing line of gems for the 64. The game is very realistic and certainly very moorish. It is also very well protected without being unfriendly. The instructions are very good and easy to follow. In short it is difficult to fault this game and it's a must for the collection, even if you're not a pool fanatic.

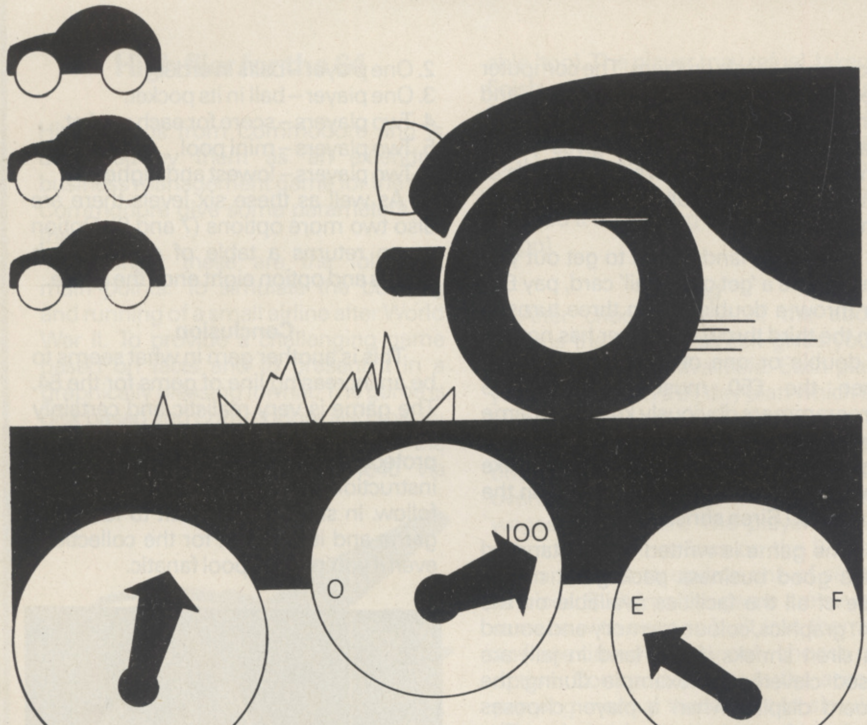


Motor Mania for the 64

The name is appropriate for a game that induces a kind of mania in those who become addicted.

Produced by Audiogenic the game is on cassette and is written in Machine Code. On running the program you are greeted with giving a title, current and high score as well as gauges for your car. The gauges are for speed, mileage, fuel and generator. Also at the display level you set the level of play from 0 to 9 by pushing the joystick forward. The game controls are joystick only (any joystick compatible with the 64). Joystick Fire starts the game, forward to accelerate, back to decelerate, left and right to steer.

The player is in control of a racing car (a well programmed sprite), the object being to travel as far as possible with the five cars you have available in each



game. The player starts in a garage, manoeuvre's out and speeds down the track, which may be a motorway, a B road or a dirt track.

On the way you must avoid other cars, as well as avalanches that periodically assault you and a demon fire engine that occasionally crosses your path, screaming in realistic tones. If you are squashed by the fire engine or the avalanche lose a life and go on to the next car; the game usually restarts at the point that the player crashed. If the car collides with another car, a rock or the side of the track you lose a life. On hitting a log you continue without losing a life but the generator becomes erratic and the radiator is damaged, a message appears telling you that the car is hot and you have to proceed to the nearest garage for repairs. On driving over glass you get a puncture, the wheel is changed and the game continues, but beware, there can be no more tyre changes, you lose a car if you drive over glass again. If the fuel gauge is low you can refuel by entering the garage and pressing the fire button.

All of this is not as easy as it may sound, and trying to master the game becomes very challenging. Based on a simple idea, Motor Mania is every bit as exciting as the arcade version where you sit in the car and steer.

Priced at £8.95, it is well programmed, easy to use and free of technical problems. It is number one on my list so far for its use of sprites, graphics colour and sound. But be sure to start on level one, which is fairly difficult and proceed as you improve. I'm sure that all levels are possible and certainly all are enjoyable, but as for level nine – phew!!

£10 BANK OF ENGLAND £10
TEN POUNDS

DON'T BURN YOUR MONEY
HIRE

YOUR VIC-20 SOFTWARE
CASSETTE HIRE ONLY £1.40 (inc P&P)
per fortnight
CARTRIDGE HIRE ONLY £2.50 (inc P&P)
per fortnight
MEMBERSHIP FEE ONLY £10.00 FOR 2 YEARS

Send Membership Fee on FULL money back approval or £1.00 for catalogue and further details, REFUNDABLE against membership fee upon joining.

To: VIC-20 USERS SOFTWARE LIBRARY
(Dept. C.C.)
11 NEWARK ROAD,
BREADSALL ESTATE
DERBY DE2 4DJ.

ASHLEY COMPUTER SERVICES
SOFTWARE FOR THE PET AND CBM 64

LEAGUE SOCCER 32K PET (New Rom) and CBM 64 **£6.50**
Features 92 League Teams, Promotion/Relegation, Cup Competitions, Team Selection, Injuries, Etc. Guide your chosen Team to League and Cup Glory!

LONDON EXCHANGE 32K PET (New Rom) and CBM 64 **£6.50**
Invest your money in any of the 233 Companies-Commodities and attempt to gain a controlling interest in 16 of Britain's major Companies!

BRIGHTON BEACH ROULETTE 16K PET (New Rom) and CBm 64 **£5.50**
Make your fortune on the spin of a wheel or by hawking your Ice Cream Van around Brighton (with due regard for nude sunbathers and Marauding Elephants!)

TEST MATACH SPECIAL 32K PET (New Rom) and CBM 64 **£6.50**
Features include choice of 4 international teams, full field settings, complete batting and balling averages kept. Your chance to improve on England's recent tour of Australia.

All prices inclusive: (Please don't forget to state machine – CBM 64, Basic 3, 4 etc)

Cheques/Postal Orders to:
ASHLEY COMPUTER SERVICES
5 Garden Street, Kirkham,
Preston PR4 2TU.
Tel: (0772) 686122

AVAILABLE FROM LEADING PERSONAL COMPUTER STOCKISTS OR DIRECT FROM COMMODORE COMPUTING INTERNATIONAL MAGAZINE

MAGNETIC MAGAZINE

AN EXCITING NEW DEVELOPMENT TO INCREASE AND IMPROVE YOUR COMPUTER SKILLS MAGNETIC MAGAZINE IS MENU DRIVEN FOR SIMPLICITY OF USE WITH CBM64 AND VIC20 WITH A WIDE RANGE OF PROGRAMMES AND CONTENT.

VIC 20

£2.99

GAMES, HINTS, TIPS, NEWS AND REVIEWS. FUTURE ISSUES WILL INCLUDE READER/USER CONTRIBUTIONS AND VIEWS PLUS ADVERTISING.

CBM 64

£2.99

IMPROVE YOUR SKILLS — PLAY ADVENTURE GAMES. LEARN HOW TO MAKE MAXIMUM USE OF YOUR CBM 64 PLUS HOW TO USE SPRITES AND THE 'SID' CHIP (SYNTHESISOR)

CCI SOFTWARE, 167 GREAT PORTLAND STREET, LONDON W1

TEL 01-636 6354

A HISTORICAL PERSPECTIVE

ANCIENT CHINESE PROVERB
FLOM MIGHTY ABACUS DOES
TINY MICLOCHIP GLOW
INPUT/OUTPUT INTERFACES

Many people are afraid of computers because they think that computers are new, innovative and revolutionary pieces of equipment that can do lots of wonderful things like take over other peoples jobs.

There are two fundamental errors here. First of all, the computer on its own without man's technology and instruction is a completely unintelligent piece of machinery. It's a bit like a car with no engine; if there is nothing to power the machine, it will not work. Computers will not work without the power supply, the motherboard and the various chips. It is often quite useless without a monitor, memory, disk drive and printer. Even if you do have all these components, you still need pieces of software. Secondly, the computer is not new.

It is theoretically possible to trace the beginnings of the modern computer right back to the days of the old Chinese abacus which has still got the old heaven and earth division used for the simple mathematical functions. So how has it come about that the simple abacus 'computer' has become so comprehensive that it now virtually controls banking systems, businesses etc and is a primary form of home entertainment?

At this point, one must go back in time again, this time to about 1643 when a gentleman called Blaise Pascal was alive. Pascal's father spent a lot of his working life performing tedious calculations that used up a lot of his time. In order to help his father, Blaise designed what was to become the very first computing machine. However, Blaise failed to realise the radical importance of his invention and he thought of it merely as a device to help his father in his work. Thirty years were to elapse before the next major step in computing history.

The Liebniz wheel, which is still used in some computers today, was invented and incorporated into a machine devised by Gottfried Wilhelm Liebniz. This machine could add, subtract, multiply and divide, and was the result of Liebniz's efforts to reduce time spent on calculations. His other aim was to create what he called Universal Mathematics, "a general method in which all truths of the reason would be reduced to a kind of calculation." In other words, he wanted to secure knowledge by reducing problems to straightforward mechanical calculations.

Thus, in theory at least, man was free from tedium and the foundations for securing knowledge via mechanical means had been laid.

So far there is one person that has been left out. He is generally regarded as the father of the modern computer. His name is Charles Babbage.

He was the inventor of the Analytical Engine and the Difference Engine which was designed to perform basic maths functions. The Analytical Engine was designed to cope with formulas. Babbage was such a genius that his inventions were far ahead of his time. Unfortunately, because of this, the skilled craftsmen of that time were not skilled enough to complete all the necessary pieces of equipment which Babbage required. As a result, Babbage could design the Analytical Engine in theory and on paper, but could not build it. Nevertheless, his contribution was important as it proved that mathematical functions more complex than the basic routines could be performed by machine, albeit rather slowly compared with the speed of today's computers. At this stage the computing industry takes a lesson from the knitting industry. Looms were difficult and time-consuming to manage and weaving patterns with the material was very tedious. The situation was resolved with the introduction of punched cards which controlled the operation of these processes. Using this technique, a series of holes in user-definable locations on the card controlled the loom and the weaving operations in the same way that, much later, a piano would be able to 'play itself' under operating instructions from the card.

From here, the story goes over to America where it was calculated that to analyse the results of a population census would take 10 years, when another census was due. Taking into account the size and population of America, the problem was an immense one. How could all the information be analysed and ready before the next census was due?

The answer came from what has become known as Herman Hollerith's punched card system, because not only did the punched cards improve efficiency in the knitting industry but it also increased output. Could the same technique be applied with the same result in the computer industry?

The answer was an emphatic yes and a major step had been taken in increasing the speed and efficiency of computer output. It also opened the way for a whole new way of inputting and outputting data, namely the paper tape reader.

One of the first mould-breaking computer installations occurred in the 1940's when a huge mainframe computer was used to calculate the launching of missiles against German cities, towns and military targets. The operation on the whole was successful apart from the occasional breakdown of the machinery which often took days to mend.

It would be a mistake to think that any piece of equipment is free from faults. Even human beings break down occasionally. It would also be a mistake to think that no study was carried out into the unreliability of the early modern computer. There is a combination of factors that has advanced these studies, especially the first really serious study which was undertaken by von Neumann in the 1950's.

For many years previously, mathematicians had worked on the notion that a machine could be programmed to do an effective computation. Given that something was effectively calculable when proved to be so, there was a need for some form of formal characterisation. There are two reasons for this, the first being that without such a characterisation no study of effective computation was possible because if you only had particular examples of computations then it could not be proved that theorems held for all computations. Secondly, without characterisation it could not be proved that something was not effectively computable. The basis for this specification of computable functions was called the primitive recursive functions. Because this class admitted that not all functions were intuitively computable, another group of functions were labelled recursive functions. Alonzo Church put forward the thesis that a function is only computable if it is recursive.

Proof of this thesis exists in the fact that no function has been found that is not intuitively computable even though it is or is not recursive. There has also been many different characterisations put forward which pick out exactly the same class of functions. The third reason is the Turing machine which also marks the beginnings of theoretical computer science.

This machine is an abstract version of the modern computer as it computes using the values of 0 and 1 and each such machine is thus a recursive function. This machine reads and writes combinations of only 0's and 1's (as in binary) so that there is no function performed by the modern computer that could not be performed by the Turing machine. For this reason alone, Turing machines have been investigated in an attempt to find out the capacities of the modern computer and an understanding of the nature of these machines.

Von Neumann investigated the problem of how to organise a machine with parts that malfunction. A machine constructed from unreliable parts is of great importance because these studies were instrumental in achieving an understanding of, and the ability to cope with the problem of reliable computation in the presence of noise.

Taking all this into consideration it would be wrong to say that the evolution of the computer stems directly from the efforts of one individual. With the development of software and peripheral devices and studies into the effects of the computer, no business or individual has been left untouched. The computer has affected everybody indirectly or directly whether they know it or not and has certainly come a lot further than Blaise Pascal's device to help his father.

NEW 64

SYNTHY-64

MUSIC AND SOUND SYNTHESIZER FOR COMMODORE-64

The COMMODORE-64 has the most sophisticated sound capabilities of any of the personal computers on the market today. A CBM-64 can play music with three voices simultaneously over a range of eight octaves!

But that's just the start of the CBM-64's sound features. You can vary the entire character of each voice. You can make the music sounds of a piano, banjo, flute, drum or most any other instrument. You can make special effect sounds such as from chimes, bells or wah-wah in endless combinations.

Commodore's manual gives you information on using the sound synthesis features. If you can make your way through the technical jargon and can POKE all of the "control registers," then you're on your way to creating your own exciting music. But if you don't want the hassle of POKing around and want to turn your CBM-64 into a full-fledged music synthesizer NOW, then SYNTHY-64 is for you.

SYNTHY-64 makes it easy for you to create music, by adding a comprehensive set of powerful commands to BASIC.

SYNTHY-64 is available on cassette with manual for just £8.95 from all main CBM-64 dealers.

SCREEN GRAPHICS 64

SUPER GRAPHICS FOR THE COMMODORE-64

Here's THE finest graphics software for your COMMODORE-64. SCREEN-GRAPHICS-64 gives you High Resolution, Multicolour and Sprite graphics all in one package! You get 320 x 200 points in High Resolution mode, 160 x 200 in Multicolour mode and Sprite graphics in either HiRes or Multicolour modes. This is the most powerful package for the Commodore-64 yet developed.

SCREEN-GRAPHICS-64 adds more than 20 powerful commands to BASIC – commands to plot points, draw lines and boxes, use Sprites and even display text with graphics. The commands are simple to use and make programming in BASIC with SCREEN-GRAPHICS-64 easy. No need to learn a new language with SCREEN-GRAPHICS-64.

SCREEN-GRAPHICS-64 is available on cassette with manual for just £8.95 from all main CBM-64 dealers.

NEW FROM ALL CBM 64 STOCKISTS

CCI SOFTWARE, 167 GREAT PORTLAND STREET, LONDON W1

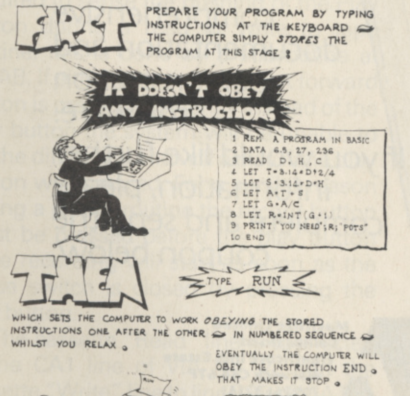
TEL 01-636 6354

BOOK REVIEW

Illustrating BASIC

This is a beginner's guide to the BASIC language with a difference. The style of presentation adopted by the author, Donald Alcock, is unique in that the whole work is hand-lettered with step-by-step diagrams that are so humorous they almost obliterate the serious nature of the contents of the book. However, that does not happen and the result is a book that is highly educational and has the added advantage of being fun to read.

This is a book designed specifically with the school environment in mind. The main aim of the book is to present BASIC as a very simple language and to instruct people how to write simple programs using this language. That does not mean that you have to be a computer scientist to understand the book. It is for pupils using computers for the first time; for those in industry who have never studied computing but need to write simple programs; for managers who do not need to write programs but need to know more about a field in which they have to take decisions; and for those who can already write in BASIC but need to buff up their knowledge of computer techniques.



FIRST PREPARE YOUR PROGRAM BY TYPING INSTRUCTIONS AT THE KEYBOARD ⇒ THE COMPUTER SIMPLY *STORES* THE PROGRAM AT THIS STAGE ;

IT DOESN'T OBEY ANY INSTRUCTIONS

```
1 REM  A PROGRAM IN BASIC
2 DATA 6.5, 27, 236
3 READ  D, H , C
4 LET T=3.14*D↑2/4
5 LET S=3.14*D*H
6 LET A=T+S
7 LET G=A/C
8 LET R=INT(G+1)
9 PRINT "YOU NEED";R;"POTS"
10 END
```

THEN TYPE RUN

WHICH SETS THE COMPUTER TO WORK *OBEYING* THE STORED INSTRUCTIONS ONE AFTER THE OTHER ⇒ IN NUMBERED SEQUENCE ⇒ WHILST YOU RELAX .

EVENTUALLY THE COMPUTER WILL OBEY THE INSTRUCTION END . THAT MAKES IT STOP .

```
RUN
YOU NEED 3 POTS
```

BUT BEFORE YOU CAN TAKE THE FIRST STEP AND START TYPING THE PROGRAM YOU HAVE TO GO THROUGH THE RITUAL OF *SIGNING ON* AND TELLING THE COMPUTER YOU WANT TO USE *BASIC*.

What sort of techniques does the book deal with? Well, for the completely uninitiated computer novice, the first few pages explain exactly what a program is, what the keyboard of a computer looks like and the very beginnings of what not to do when writing a program. An example of this is the fact that spaces between symbols in a condition like IF-THEN are not allowed.

Naturally, as the book progresses through the chapters, of which there are nine plus an index, the topics covered become more involved. In the ensuing chapters, Alcock gently guides the reader through the components of the language, expressions, functions and the mathematics of computer programming. I always thought that mathematics was far too complicated for idiots to thoroughly understand, but when Alcock tackles matrices and arrays the subject of mathematics in computing is easy as ABC. However, there are various forms of BASIC around, some of which differ tremendously from one another. How can you be sure that the BASIC used in your machine is adequately catered for in this book?

Once again, Alcock comes up with the solution. He attempts to make the BASIC he describes to be as independent of any machine as is possible and in order to achieve this he examined eleven different versions of the language and points out their variations.

Why is it that more books are not done like this one? At only £1.95 this book is definitely a bargain and my congratulations go to the author for producing an educational book that is both interesting and fun to read.

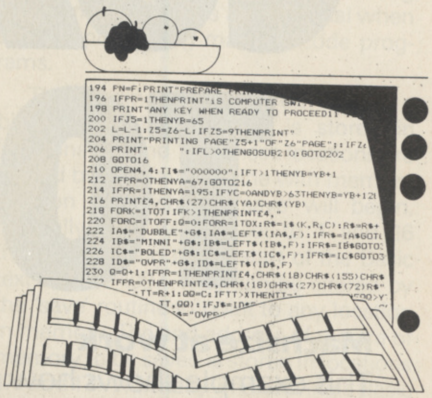
Title:	*Illustrating BASIC (School Edition)*
Price:	*£1.95*
Author:	*Donald Alcock*
Publisher:	*Cambridge University Press*
Address:	*The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU.*

Learning to use the Commodore 64 Computer

Learning to use the Commodore 64 Computer by William Turner is another beginner guide, this one in the usual printed format. It is the latest in the Learning to use series, the subject of its predecessors being the PET and the VIC 20.

As with many other beginner's guide books, this is aimed at those people who know practically nothing about the 64 but want to use it for work or leisure and is not aimed at those people who want to become expert theorists in computing.

It certainly satisfies the first of its aims because it is not until the reader gets to chapter three that any serious programming is attempted. Everything prior to this is dedicated to explaining what the 64 is (it's a computer), what it does and how to use it. Surely, anybody with the remotest interest and knowledge of Commodore Business Machines and computing in general should know what the 64 is? Despite this apparent piece of banality, what it does and how to use it are of the utmost importance to any potential user.



```
194 PN=F:PRINT"PREPARE
196 IFPR=1THENPRINT"iS COMPUTER SW
198 PRINT"ANY KEY WHEN READY TO PROCEED!!
200 IFJ5=1THENYB=65
202 L=L-1:Z5=Z6-L:IFZ5=9THENPRINT"
204 PRINT"PRINTING PAGE"Z5+1"OF"Z6"PAGE";:IFZ
206 PRINT"        ":IFL>0THENGOSUB210:GOTO202
208 GOTO16
210 OPEN4,4:TI$="000000":IFT>1THENYB=YB+1
212 IFPR=0THENYA=67:GOTO216
214 IFPR=1THENYA=195:IFYC=0ANDYB>63THENYB=YB+12
216 PRINT£4,CHR$(27)CHR$(YA)CHR$(YB)
218 FORK=1TOJ:IFK>1THENPRINT£4,"
220 FORC=1TOFF:Q=0:FORR=1TOX:R$=I$(K,R,C):R$=R$+
222 IA$="DUBBLE"+G$:IA$=LEFT$(IA$,F):IFR$=IA$GOT
224 IB$="MINNI"+G$:IB$=LEFT$(IB$,F):IFR$=IB$GOTO
226 IC$="BOLED"+G$:IC$=LEFT$(IC$,F):IFR$=IC$GOTO3
228 ID$="OVPR"+G$:ID$=LEFT$(ID$,F)
230 Q=Q+1:IFPR=1THENPRINT£4,CHR$(18)CHR$(155)CHR$
    IFPR=0THENPRINT£4,CHR$(18)CHR$(27)CHR$(72)R$"
```

It is in this area that the book starts to come into its own with detailed information that starts with a line by line explanation of what appears on the screen when the VIC is switched on for the first time, the importance of the video monitor and the machines capability to draw and SAVE detailed pictures through to the sound facilities and what is actually inside the 64. The accompanying diagrams, photographs and program listings are of a fairly simple nature but, like practically everything else in this book, they are highly instructive and of a very good quality reproduction.

Many applications for the Commodore 64 are described. The 64 was designed with many serious applications in mind: commerce; industry; education and home use and to give an indication of the power of the machine for these applications there is a brief outline of what sort of programs are available on the 64.

This is definitely one of the best books around at the moment that explains the 64 and any beginner on the 64 should definitely buy this book. Congratulations to the author again.

Title:	*Learning to use the Commodore 64 Computer*
Price:	*£4.95*
Author:	*William Turner*
Publisher:	*Gower Publishing Company Ltd*
Address:	*Gower House, Croft Road, Aldershot, Hampshire GU11 3HR*
Tel:	*0252 331551*

THE COMPLETE TOOL-KIT

Machsize at work

This example shows how the standard CBM Machines may be rack mounted and suitably protected to ensure continued operation in workshop conditions to function as efficient Plant Control and Process Monitoring Units – when combined with the Machsize 'Interface 80' range of flexible circuit cards.

Interface 80: The complete system that provides answers to your engineering problems. A guaranteed working system without excessive development.

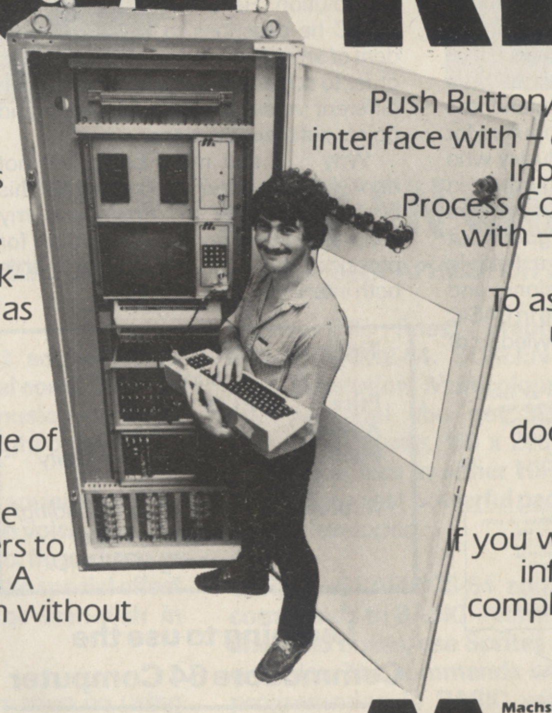
The basic kit

The basic system comprises power supply (240/110V AC); IEEE–488 Decoder Card providing a fully decoded "talk" and "listen" bus with handshaking and 32 Secondary Addresses; and a Primary Address decoding set by on-board jump plugs.

Tools of the trade

Flow speed – interface with – Totaliser/Counter.

Pressure/Temperature – interface with – AD plus 32 Channel Multiplexor.



Push Button/Limit Switches – interface with – 6 Decade Digital Input/Output Card

Process Control – interface with – Quad 8 Bit D/A Convertor

To assist the first time user, each card is supplied with comprehensive documentation and demonstration software.

If you would like further information, please complete and send the coupon below.

Machsize Limited
Collins Road
Heathcote Ind. Estate
Warwick C34 6TF
(0926) 32141
Telex 312376

commodore
COMPUTER

Please tell me more:
Name...
Position...
Company...
Address..
....
....
Post Code...

Machsize Limited
Collins Road
Heathcote Ind. Estate
Warwick C34 6TF
(0926) 32141
Telex 312376

The Cassette Unit

The Cassette Hardware

The VIC has a single external cassette unit which is used for program and data storage. The cassette deck is connected to the VIC by six lines – Write, Read, Motor, Sense, and two power lines, a ground and +5 volts. The cassette is controlled by I/O lines from the two VIA chips. The cassette motor power supply lines are connected to the interface chips via a three-transistor driver used to boost the power and voltage, allowing the motor to be driven directly. The output to the motor is an unregulated +9 volts at a power rating of up to 500ma. The cassette deck motor can be turned on and off by toggling the CA2 line on 6522 No. 1:

POKE37148, PEEK(37148) AND 241 OR 14 turns the motor on
POKE37148, PEEK(37148) OR 12 AND NOT 2 turns it off

The sense line input, line PA6 on VIA No. 1., is connected to a switch on the cassette deck which senses when either the Play, Rewind or Fast Forward buttons have been pressed. The switch is only required to sense the pushing of the Play button during a read or write to tape routine, this is done by a subroutine at $F8AB. If either the rewind or fast forward button is pressed accidently instead of the play button the system will be unable to tell the difference and will act as if the play button was pressed. For a similar reason during a record routine the record button must be pressed before the play button since recording will start as soon as the sense switch is closed by pressing the play button.

The cassette "Read" line is connected to the CA1 line of VIA No. 2., and the cassette "Write" line to line PB3 of VIA No. 2. During a Read operation the operating system uses the setting of the CA1 interrupt flag to detect transitions on the cassette Read line. The functioning of the Read and Write lines is controlled entirely by the operating system, the only hardware required being signal amplification and pulse shaping circuitry. These circuits are contained on a small PC board within the cassette deck, their function being to give correct voltage and current to the record head and amplify the input from the read head to give a 5 volt square wave output able to produce an interrupt on the CA1 or CB1 lines.

The Cassette Operation

In normal usage the cassette deck is assigned an I/O device number, the cassette is device number 1, the number of the device currently being used is stored on location 186. The device number, the logical file number and the secondary address are used when saving or retrieving data files from the cassette deck. The logical file number can be any number from 1 to 255 and is used to allow multiple files to be kept on the same device, it is of little use with cassette tape and primarily intended for use with floppy disk units. It is usual to have the logical file number the same as the device number, the logical file number of the current file is stored in location 184. The secondary address is important since it determines the operational mode of the cassette, the current secondary address is stored in location 185 the normal default value being zero. If the secondary address is zero then the tape is Opened for a "read" operation, if set to 1 then it is opened for a "write" operation and if 2 then it is opened for a "write" with an end of tape header being forced when the file is closed.

The VIC operating system is configured to allow two different types of file to be stored on cassette: program files and data files. These names are however rather misleading since a program can be stored as a data file and data can be stored as a program file. The difference between these two file types is not in their application but in the way the contents of the machines memory is recorded. Instead of program and data files we must look upon the as Binary and ASCII files.

A binary file is usually used to store programs, since a binary file is created by the operating system to store the contents of memory between a starting location and an end location. Called a binary file because it stores on tape the binary value in each memory location within the assigned memory area. Basic statements are stored in memory using tokens. The use of tokens means that Basic commands are not stored in the same manner as they are listed on the display or were entered on the keyboard. They are instead stored in memory in a partly encoded form. Being partly encoded, a binary file is a quicker and more efficient way of storing programs. Binary files are essential when saving and loading machine code programs.

The starting address from which a binary file will be saved is stored in locations 172 and 173. These locations are loaded by the Save routine with memory location at which the 'save' will begin, normally they will be set to 1 and 16 thereby pointing to the start of the Basic text area at 4097. They can be altered by the 'save' routine to point to any location in memory. The end address of the ara of memory to be saved is stored in locations 174 and 174. Normally when saving a Basic program these are set to the address of the double zero byte terminating link address. The end address can be altered to any desired location. To change either of these addresses one can not use the normal save routine since this automatically initialises these locations. Instead one must write a small machine code initialisation routine incorporating the desired operating system subroutines. By default a Save command will write a binary file and a Load command will read a binary file.

ASCII files are normally used to store data (but can be used to store programs), and the format is the same as that displayed on the screen or entered on the keyboard. ASCII files are created or read almost exclusively by instructions from within a basic program. A binary file is created or read mostly by direct instructions, although the LOAD and SAVE instructions can be used within a program.

An ASCII file must first be opened with an OPEN statement, this specifies the logical file, device number, secondary address and file name. The operating system interprets these parameters and allows the user to read or write the file to the specified device. Data is written to an ASCII file on a particular device with a command to PRINT to specified logical file number and data is read by a READ from logical file command.

Whereas a binary file is loaded with the contents of successive memory locations, an ASCII file is loaded with a string of variables. Storing these would require the tape to be turned on and off repeatedly, storing a few bytes at a time. The VIC overcomes this by having 192 byte tape buffer into which all data to be written "to" or read "from" tape is loaded. Only when this buffer is full is the tape motor turned on. Data is stored on tape in blocks of 192 bytes and since the motor is turned on and off between blocks a two second interval is left between blocks to allow the motor to accelerate and decelerate. The beginning of the 192 character buffer starts at address 828. The pointer to the start of the buffer is located at address 178 and 179. The number of characters in a buffer is stored in locations 166. These locations can be used by the programmer to control the amount of space left in a data file. If having opened a file on cassette, the command POKE 166, 191 is executed then the contents of the tape buffer even if empty are loaded onto the tape. If records are kept in multiples of 191 bytes we can very easily keep nul or partially filled records allowing future data expansion.

Whether the file being stored is binary or ASCII the recording method is the same involving an encoding method unique to Commodore and designed to ensure maximum reliability of recording and playback. Each byte of data or program is encoded by the operating system using pulses of three distinct audio frequencies, these are long pulses with a frequency of 1488Hz, medium pulses at 1953Hz and short pulses at 2480Hz. All these pulses are square waves with a mark space ratio of 1:1, one cycle of a medium frequency is 256 microseconds in the low state. The operating system takes about 9 milliseconds to record a byte of data consisting of the eight data bits, a word marker bit and an odd parity bit. The data bits are either ones or zeros and are encoded by sequence of medium and short pulses: a "1" is one cycle of a medium length pulse followed by one cycle of a short length pulse and "0" is one cycle of a short length pulse followed by one cycle of a medium length pulse. Each bit consists of two square wave pulse cycles, one short and one medium with a total duration of 864 microseconds.

The 'odd parity' bit is required for error checking and is encoded like the eight data bits using a long and short pulse, its state is determined by the contents of the eight data bits. The 'word marker' separates each byte of data and also signals to the operating system the beginning of each byte. The word marker is encoded as one cycle of a long pulse followed by one cycle of a medium pulse.

Since a byte of data is recorded in just 8.96 milliseconds, a 192 byte block of data in an ASCII file should be recorded in just over 1.7 seconds. However, on timing such a recording we find it takes 5.7 seconds. There are two causes for this discrepancy in timing. Firstly to reduce the possibility of audio dropouts the data is recorded twice. Secondly a two second inter-record gap is left between each record of 192 bytes.

The extensive use of error checking techniques is one reason why the tape system on the VIC is so much better than that available on most other popular computers. There are two levels of error checking. The first divides the data into blocks of eight bytes and then comutes a ninth byte, the checksum digit. The checksum is obtained by adding the eighth data bytes together, the checksum is the least significant bute of the result. On reading the tape if one bit in the eight butes is dropped and a zero becomes a one or vice versa the checksum can be used to detect this error. To do this the same procedure to calculate the check digit is performed, the result will be different to that stored in byte nine, the check digit of that block computed when the tape was recorded. The second level of error checking involves recording each block of data twice. This allows error detected by the check digit to be corrected during the second reading of the 192 byte data block. By recording the data twice a verification can be performed by comparing the contents of the two blocks, this will detect the few errors not detected by the checksum.

The use of pulse sequence rather than two frequencies as in a standard FSK recording has a great advantage since it allows the operating system to easily compensate for variations in recording speed. Normally a hardware phase locked loop circuit would be used to lock the system onto the correct frequencies coming from the tape head, the VIC however uses software to perform this process. A ten second leader is written on the tape before recording of the data or program commence. This leader has two functions, first it allows the tape motor to reach the correct speed and secondly the sequence of short pulses written on the leader is used to synchronise the read routine timing to the timing on the tape. The operating system can thus produce a correction factor which allows a very wide variation in tape speed without affecting reading. The system timing used to perform both reading and writing is very accurate, based as it is on the crystal controlled system clock and Timer 1 and Timer 2 of VIA No. 2 Inter-record gaps are only used in ASCII files and their function is to allow the tape motor time to decelerate after being turned off and accelerate to the correct speed when turned on prior to a block read or write. Each inter-record gap is approximately two seconds long and is recorded as a sequence of short pulses in the same manner as the ten second leader. There is also a gap between blocks, when the first block of 192 bytes is recorded it is followed by 50+ cycles of short pulses then the second recording of the 192 block starts, this is identical to the first block.

The first record written on the tape after the ten second leader in both ASCII and binary files is 192 character file header block. The file header contains the name of the file, the starting memory location, and the end location. In an ASCII file these addresses are the beginning and end of the tape buffer, in a binary file they point to the area of memory in which the program is to be stored.

The file name can be up to 128 bytes long, the length of the file name is stored in location 183, and when read is compared with the requested file name in the Load of Open command. If the name is the same then the operating system will read the file, if different then it will search for the next ten second interfile gap and another header block. The file name is stored during a read or write operation in a block of memory, the starting address of which is stored in locations 187 and 188. On completion of the operation these are reset to point at a location on the operating system. The starting location is normally set to the beginning of the user memory area, address 4097, however it can be changed to point to any location, a method employed when recording programs in a machine code using the monitor, and also in the no copy program. The starting address is pointed to by the contents of locations 172 and 173, the end address being stored in locations 174 and 175. Normally this is the highest byte of memory occupied by the program, however it can be altered to point to any address providing it is greater than the start address.

Important Memory Locations Used by the VIC Cassette

$92	– temp used to adjust software servo
$93	– verify or load flag (0=loading)
$96	– flags if we have block sync (16 zero dipoles)
$9B	– holds currently calculated parity bit
$9C	– cassette dipole switch
$9E	– count of read locations in error pointer into $0100
$9F	– count of re-read locations during pass No. 2
$A4	– used to indicate which half of dipole we are in
$A5	– countdown for tape write; sync on tape header
$A6	– cassette buffer pointer
$A7	– tape short count
$A8	– flags errors (if zero then no error)
$A9	– counts zeros (if zero then correct No of dipoles)
$AA	– bits 6 & 7 hold function mode, rest = sync.
$AC-$AD	– indirect address to start of tape data storage
$AE-$AF	– indirect address to end of tape data storage
$B1	– holds dipole time during types calculations
$B1-$B3	– start address of tape buffer
$B4	– flags if we have a byte sync (a longlong)
$B5	– used to preserve sync outside of bit routines
$B6	– has combined error values from bit routines
$B7	– length of current file name string
$B8	– current logical file number
$B9	– current secondary address
$BA	– current device number
$BB-$BC	– address of current file name string
$BD	– receive input character
$BE	– indicates which block we are looking at (0 to exit)
$BF	– holds input byte being built
$CO	– cassette manual/controlled switch
$C3-$C4	– cassette load temp storage
$D7	– holds most recent dipole bit value
$0100-$01FF	– storage of bad read locations, bottom of stack
$0259-$0262	– logical file number table
$0263-$026C	– device number table
$026D-$0276	– secondary address table
$033C-$03FC	– cassette buffer

System Subroutines used by the VIC Cassette

$F542-$F646 – Load RAM routine. Loads from cassette or serial device as determined by contents of $BA. Verify flag in .A. Alternatively load if $B9 = 0 (normal $B9 = 1) .X, .Y contain load address if .A = 0 performs load (1 is verify).

High load address returned in .X and .Y.

$F675-$F734 – Save RAM routine. Saves to cassette or serial device selected by contents of $BA. Start of save is indirect at .A, end of save is .X, .Y.

$F7AF-$F889 – Find tape header information. Reads tape until one of the following block types is found: basic data file header, or basic load file. For success cary is clear on return. In addition accumulator is 0 if stop key is pressed.

$F88A-$F89E – Miscellaneous tape control routines. Include:

F8AB	– cassette sense switch check
$F8B7	– check for play and record
$F8C0	– read header block entry
$F8C9	– read load block entry
$F8E3	– write header block entry
$F8F4	– start tape operation entry point
$F95D	– set to timeout watch for next dipole

$F98E-$FABC – Cassette read routines. The character read is passed to the bute routine in location $BF.

$FABD-$FBE9 – Byte handler for cassette read. The byte assembled from reading tape is passed to this routine in $BD. $A8 is set if byte read is in error and $A9 is set if the interrupt program is reading zeros. $AA tells us what we are doing, bit 7 says ignore bytes until $A9 is set and bit 6 says load the byte. Otherwise $AA is countdown after sync. If $93 is set we do a compare instead of store and set status. $BE counts the two blocks, $9E is the index to the error table for pass No. 1., and $9F is index to correction table for pass No. 2.

$FBEA-$FD21 – Cassette write routines. Location $BE is the block counter for record. If $BE = then first header
= 1 first data
= 0 second data

Note: The IRQ vectors are changed during cassette operation, if the user has reset these vectors then they should be restored to their normal value prior to using the cassette.

BUSICALC

Easiest to learn of all the spreadsheet programs for Commodore machines and still a top-seller. Versions are available for PET 3032, PET 4032, CBM 8032, VIC-20 with 16k expansion, and of course the CBM 64. BUSICALC files on disk or tape can be transferred between machines (so you could use an 8096 in the office and a VIC-20 or 64 at home!). Whether you're a home user or running a major company BUSICALC can help you plan, budget, forecast, or fantasise, and at £39 plus VAT on tape, or £41 plus VAT on disk you won't need a second mortgage to buy it!

and now ...

BUSICALC 2

Commodore 64 users now have a choice: BUSICALC or BUSICALC 2. And although the new version takes full advantage of the 64k memory allowing a larger sheet and many more functions, it retains the inherent simplicity of the original. BUSICALC 2 doesn't have a HELP page – because you won't need one. It's as simple as that!

BUSICALC 2 has 25 intrinsic functions (including conditional functions, statistical functions, trigonometric functions, and 3 user-defined functions). Up to 20 levels of parentheses are allowed. Rows and columns can be inserted or deleted; any part of the sheet can be replicated, erased, saved, or printed. Formulae can be printed, and special files can be created quite simply for use with other programs.

Each sheet may have up to 999 rows or 125 columns provided that the total number of boxes does not exceed 2500. BUSICALC 2 has a unique VU function which enables up to 5 different parts of the sheet to be displayed simultaneously – and a very fast FIND command that will search the entire sheet in less than a second. You can use BUSICALC 2 for price lists, stock lists – even as a telephone directory – as well as the standard 'what if' exercises. Sheets on tape or disk can be added to or subtracted from the sheet in memory so that consolidating departmental budgets into a group budget is a piece of cake!

BUSICALC 2 is available NOW, but only for the Commodore 64. It costs £69 plus VAT on tape or £71 plus VAT on disk.

You can buy SUPERSOFT products from your local dealer, or by post. Pre-paid orders are post free in the UK. Overseas orders are free of VAT, but please add postage.

6502 PROGRAMMERS WANTED!

We need more machine code programmes to write for us on a royalty basis. You must be an expert on the 6502 and knowledge of other processors would be useful.

SUPERSOFT

Winchester House, Canning Road, Wealdstone,
Harrow, Middlesex, HA3 7SJ
Telephone: 01-861 1166

HINTS & TIPS

A Collection Of Techniques And Tips For All Machines

Have Fun With The Wait Command

Most of us utilise the wait command very little in our everyday programming but there are some very useful wait commands available.

First though a look at what the wait command actually does:

The format of the wait command is WAIT,I,J,K. When this is executed, the contents of I are OR'ed with K and AND'ed with J. If the result of this is zero, the process is repeated until it becomes non-zero. As this routine is basically a test on bits in a memory location, the values of J and K would best be powers of 2 (0,1,2,4,8,16,32,64,128). However, waiting for combinations of bits can also be useful but it must be noted that whilst the WAIT command is in operation, the stop key is not checked and so one must be careful not to choose a combination that will never occur.

An example of a simple use for WAIT could be as a replacement for:
100 GET A$: IF A$=“ ” THEN 100
The WAIT equivalent would be:

100 WAIT 198,1: GET A$: rem for the 64 and VIC.
or,
100 WAIT 158,1: GET A$: rem for the PET basic 2.

This is obviously to wait for a key press, but actually what it is doing is waiting for a character to be put into the keyboard buffer and testing the number of characters in the buffer.

The wait command can also be used to wait for a button on the cassette deck to be pressed, or even waiting for any of the directions on the joystick (see hints and tips July).

The wait command can also be used to wait on the clock. The real time clock occupies locations 141-143 (160-162 on the VIC, 64). WAITing for one particular bit in the clock to change state gives an interesting delay effect. For example: WAIT 142,1,1 will wait for the right most bit of the second byte. This bit changes every 256th of a jiffy (slightly over 4 seconds). WAIT 143,1,1 will wait till the start of the next jiffy.

While some of these are not particularly useful, playing with the WAIT statement is quite a bit of fun. If anyone finds any more useful or interesting locations, we'll be WAITing to hear from you.

Alternative Variable Set For The 64

This program is set up as a Basic loader for a machine code routine which allows the user to have a secondary variable area in memory. The secondary area is located in the 4K machine code RAM from 49152 to 53247. Variables with certain values in the primary area will have no value or a different value in the secondary area. The routine allows the use of variables, arrays, and strings in the usual use.

Computed Jumps On The 64

Firstly this month, here are two useful routines for the 64. They both follow the same lines as they allow computer jumps in a Basic program. They both come in the form of a loader and are tested at the end of loading.

Using the routines instead of GOTO and GOSUB, you may have a variable line number to jump to or even an equation. For example instead of having:
100 ON N GOTO 1000, 1010, 1020, 1030, 1040, 1050, 1060
you could have
100 SYS(828),990+N*10,0
which will do the same thing. Both of these routines will happily reside in memory without conflicting addresses.

```
READY.
LISTING 1


1 REM * * * *  COMPUTED GOTO  * * * *
2 :
3 REM SYS828,N*10+10,0
4 REM DOES A GOTO (N*10+10)
5 REM
6 REM NOTE  : PROGRAMS USING THIS WILL
7 REM         NOT RENUMBER CORRECTLY
10 FORI=828TO838
20 READA
30 POKEI,A
40 NEXT
50 PRINT"DATA LOADED  ";
80 REM TEST SYS BY USING IT
90 REM (DATA ERROR WILL CAUSE CRASH)
100 A=20
```

```
110 SYS828,A*100,0
120 :
1000 DATA104,104,32,253,174,32
1010 DATA235,183,76,166,168
1020 :
2000 PRINT"AND CHECKED
2010 END
READY.
LISTING 2

1 REM * * * *  COMPUTED GOSUB  * * * *.
2 :
3 REM SYS848,N*10+10,0
4 REM DOES A GOSUB (N*10+10)
5 REM
6 REM NOTE : PROGRAMS USING THIS WILL
7 REM        NOT RENUMBER CORRECTLY
10 FORI=848TO884
20 READA
30 POKEI,A
40 NEXT
50 PRINT"DATA LOADED  ";
80 REM TEST SYS BY USING IT
90 REM (DATA ERROR WILL CAUSE CRASH)
100 A=20
110 SYS848,A*100,0
120 PRINT"AND  RETURN OK !
130 END
1000 DATA104,104,169,3,32,251,163,165
1010 DATA123,72,165,122,72,165,58,72
1020 DATA165,57,72,169,141,72,32
1030 DATA121,0,32,253,174,32,235
1040 DATA183,32,166,168,76,174,167
2000 PRINT"AND CHECKED
2010 RETURN
READY.
```

Delete all arrays

As a follow on from the last article, this routine will delete all arrays but leave the variables and strings intact. The method is to drop the top of arrays memory pointer down to meet the bottom of arrays pointer. This routine is for the 64. For the VIC, take out the +2 (to the power of) 16 addition to the printing of FRE(0). For the Basic 2 PET owners, another change is required, that of the pointer locations. These locations are found on lines 70 and 80. They should be changed to:

70 POKE 46, PEEK(44)
80 POKE 47, PEEK(45)

```
READY.
DELETE ARRAYS

1 REM       * * DELETE ALL ARRAYS * *
2 :
3 REM RELEASE MEMORY USED BY ARRAYS
4 REM WITHOUT DAMAGING OTHER VARIABLES
5 :
9 REM LETS HAVE SOME TEST VARIABLES
10 DIMB(1000)
15 DIMZ$(50)
16 Z$(45)="FRED"
20 A=3
40 A$="CARL"
50 PRINT"MEM FREE:";FRE(0)
70 POKE49,PEEK(47)
80 POKE50,PEEK(48)
90 PRINT"MEM FREE:.";FRE(0)+2↑16
100 PRINTA
110 PRINTA$
120 DIMB(10)
130 DIMZ$(19)
140 PRINT"MEM FREE:";FRE(0)+2↑16
READY.
```

HINTS & TIPS

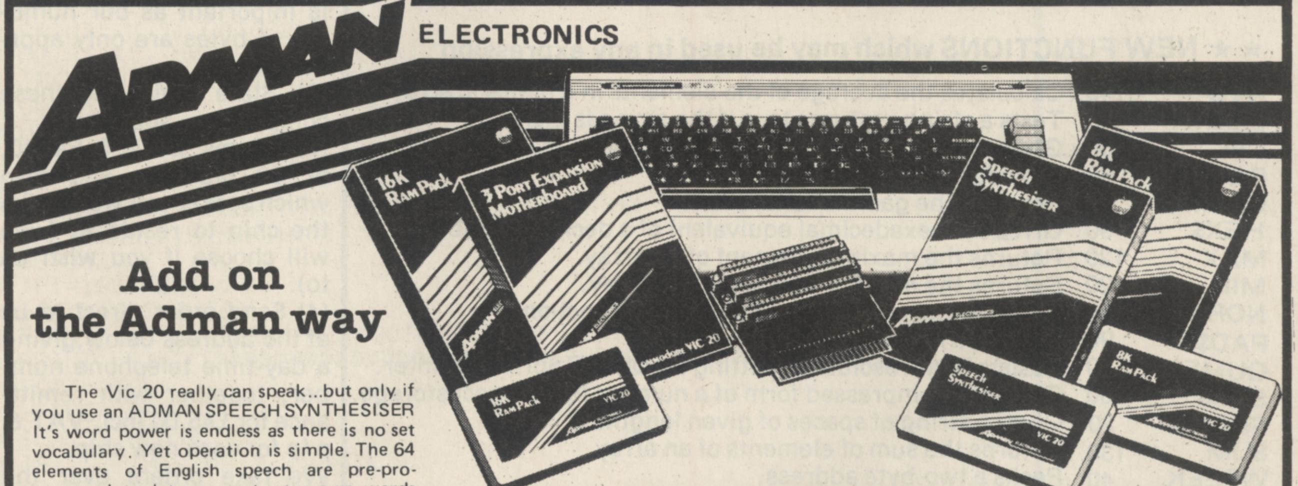
```
READY.
Alternative Variables

5 REM * * * ALTERNATE VARIABLES * * *
6 REM NORMAL VARIABLE SET UNCHANGED
7 REM EXTRA VARIABLE SET USES MEMORY
8 REM $C000 TO $CFFF
9
10 FORI=820TO864
20 READA
30 POKEI,A
40 NEXT
50 REM TEST BY USING (CRASH IF ERROR)
60 SYS820
70 CLR :REM CLEAR NEW VARIABLE SET
80 PRINT"OK SO FAR
90 A$="IT WORKED"
100 SYS820
110 A$=" VERY WELL"
120 SYS820
130 PRINTA$;
140 SYS820
150 PRINTA$
160 END
1000 DATA162,13,181,44,72,189,80
1010 DATA3,149,44,104,157,80,3
1020 DATA202,208,241,96,0,0,0
1030 DATA0,0,0,0,0,0,0
1040 DATA8,1,192,0,192,0,192
1050 DATA255,207,255,207,255,207
1060 DATA255,200,0,0,0,0,0
READY.
```

Basic Disassembler

Finding out what some machine code routines do is very hard on the 64 if you do not own a machine language monitor such as extramon. This next routine is a basic disassembler program that displays, a page at a time, a disassembly of the area of memory that is required. All that is needed by the user is to enter the start address in decimal and the screen will fill up with the disassembly from that point.

This program will work on all machines but with the VIC, the display will not be very good as it was written to fit on a screen of 40 or more columns and 25 lines.

```
10 DIMT$(255):FORI=0TO255:READT$(I):NEXT
20 INPUT"DECIMAL START ADDRESS";A
30 PRINT"♥";
40 FORM=1TO24
50 I=PEEK(A)
60 K=(I)AND15
70 IFI=0THENL=1:GOTO260
80 IFK=8THENL=1:GOTO260
90 IFK=10THENL=1:GOTO260
100 IFK<>0THEN140
110 IFI=32THEN180
120 IF(I)AND16THEN140
130 IFI<128THENL=1:GOTO260
```



ADMAN ELECTRONICS

Add on the Adman way

The Vic 20 really can speak...but only if you use an ADMAN SPEECH SYNTHESISER It's word power is endless as there is no set vocabulary. Yet operation is simple. The 64 elements of English speech are pre-programmed to let you put your own words together as soon as you switch on. Just imagine...program adventure games with characters that can actually talk!

Also for your Vic 20 there are 8K and 16K RAM PACKS and the ADMAN 3 PORT EXPANSION MOTHER BOARD. With proven designs of the highest quality they are the best value for money around.

The Vic 20 speaks out!

Available from Spectrum, Dixons and other major computer accessory shops

Prices around:

8k Ram Pack	**£39.95**
16k Ram Pack.	**£49.95**
Motherboard.	**£19.95**
Speech Synthesiser . .	**£49.95**

To find out more about these products, why not take a lead from our speech synthesiser...go to your local dealer and ask for it! Or post the coupon.

Dept. C, Adman Electronics Ltd., Ripon Way,
Harrogate, N.Yorks, HG1 2AU. Tel. 0621 740972

Please send me information on Adman Vic 20 Accessories

Name ____________________

Address ____________________

____

CC/9/83

Adman Electronics Ltd. is a member of the Adam Leisure Group PLC

Does your PET need a new chip? You need a SOFTCHIP !

Write professional quality software. Save money and perhaps earn some !
YOU NEED SOFTCHIP.

As sold to Universities, Industry and Professional Software Houses. Our routines cut development time by half, increase normal disk capacity by a factor of three, the list goes on and on ! Harness our machine-code from your Basic programs using simple Basic commands like :

APPROXIMATE MEMORY USAGE

AUTO	40	Provides automatic line numbering.
BEEP	60	Plays music of given duration and pitch.
BLOAD	40	Loads in a block of memory without affecting BASIC execution.
BSAVE	120	Saves the memory area between two given addresses.
CALL	80	Enter a machine-code subroutine with given Acc,X- & Y-reg.
CIF,CEND	220	Four commands which provide facilities for structured BASIC,
ELIF,ELSE		largely eliminating the need for the GOTO command.
CURSOR	30	Places the cursor at position x,y on the screen.
DATIN	690	Foolproof input routine for dates with full error detection.
DELETE	70	Deletes a given range of program lines.
DISABLE	50	Disables the run/stop key without affecting the internal clock.
DISP	140	Displays a prompting or warning message on a given line.
DREAD	100	Reads data from disk without input restrictions.
DSEARCH	330	Searches a disk relative-file for a given string or pattern.
DUMP	170	Outputs the names and values of all current scalar variables.
EDIT	70	Adds 'delete-forwards' function.
EXEC	140	Executes a string as a BASIC command.
FIND	200	Lists all lines in which a given character string appears.
GENIN	700	General foolproof input routine with selected key disablement.
GSUB	110	Performs a GOSUB to a given labelled line.
GTO	90	Performs a GOTO as above.
INPUT	40	Allows a program to continue despite a null entry being input.
INVERT	160	Turns a string back to front.
IRQ	60	Restores normal system use of interrupts.
KILL	20	Takes out SOFTCHIP commands.
LINES	50	Calculates the number of lines in a program.
LWIND	170	Loads a screen display from a compressed format file.
MERGE	360	Merges a program from tape or disk into the current program.
MON	10	Enters the CBM machine-code monitor.
MOVE	130	Moves a block of memory to another position in RAM.
NUMIN	740	Foolproof input routine for amounts of money.
PCTRL	100	Set the device number and characteristics of the printer.
PLOT	170	Plots a double-density point on the screen.
POP	30	Removes the last subroutine return address from the stack.
PRINT	130	Adds routine to automatically right-justify amounts of money.
PRINT	280	Modifies all printer-output as needed and adds TAB function.
PUSH	60	Pushes a return address onto the stack.
RENU	930	Renumbers a program, altering all GOTO's, THEN's, etc.
REPEAT	50	Adds repeat key function.
REPLACE	490	Replace all occurrences of one character string with another.
RESCUE	40	Recovers a program accidentally 'NEW'ed.
RESET	170	Resets a double-density point on the screen.
RESTORE	20	Restores DATA back to a given line number.
REVERSE	50	Reverses the field of the screen.
SCAN	190	Scans a string for the next occurrence of a given character.
SCOPY	340	Copies the screen to the printer.
SCROLL	230	Scrolls screen contents up,down, left or right.
SEARCH	270	Searches an array for a given string or pattern.
SHRINK	180	Removes all unnecessary spaces and 'REM's from a program.
SORT	760	Sorts any one-dimensional array (and tags another array along)
SWAP	440	Loads in another program, retaining all variables.
SWIND	150	Saves the contents of the screen in a compressed format.
TRACE	110	Displays the last six line numbers at the top-right screen.
VAR	390	Outputs the names of all variables referred to in a program.
WINDOW	30	Sets top, bottom, left, right for an 8032 screen window.
WPOKE	50	Pokes two memory locations in hi-lo 6502 order.

★ ★ NEW COMMANDS NOW AVAILABLE

BORDER	100	Draws a border around the edge of the screen
CLOCK	250	Continually displays the time at a given screen position.
GRAPH	20	Gives access to the box-drawing characters on an 8032
ON	50	Branches to program line corresponding to key pressed.
PROTECT	90	Allows regain of control after system crash.
STATS	120	Outputs the number of statements in the current program.

★ ★ NEW FUNCTIONS which may be used in any expression

AVG	140	Calculates the average of the elements in a numeric array.
BLANK	40	Tests a string : returns true if the string is blank.
DEC	80	Gives the decimal equivalent of a hexadecimal number.
FACT	60	Provides the factorial function.
GAMMA	90	Provides the gamma function.
HEX$	90	Gives the hexadecimal equivalent of a decimal number.
MAX	120	Returns the maximal element of an array.
MIN	120	Returns the minimal element of an array.
NORM	160	Provides the normal distribution area function.
PAD$	90	Pads a string with spaces.
QUME$	70	Assists high-resolution plotting on QUME Sprint 5 printer.
SHR$	260	Gives the compressed form of a number for compact storage.
SPC$	30	Gives a string of spaces of given length.
SUM	130	Returns the sum of elements of an array.
WPEEK	40	Peeks a two-byte address.
XPD	220	Decompresses a number.

ONLY £45 ALL INCLUSIVE FOR YOUR CHOICE OF 3700 BYTES

HERE'S HOW TO ORDER

(1) Choose around 3700 bytes worth : the number of bytes is beside the name.

(2) Write your selections in order of preference - this is important as our numbers of bytes are only approximate.

(3) State which of these computers you have : New Roms, Basic 4, Fat 40, or 80-column : and also which socket you would like the chip to reside in (we will choose if you wish us to).

(4) Send order direct to us at the address below,giving a day-time telephone number, together with remittance for £45.00 incl. VAT & p/p for each new chip.

We take orders over the phone from government organisations.

Full and free details of current library of SOFTCHIP commands available.

plus: *Whitby Basic* ..£99.00 incl.........a revolutionary new disk-based language for the Commodore range which is as big a step forward as electric light was from candles.......this is the language the PET should have had when it was introduced ! Get details now from your nearest Commodore dealer or direct from

WHITBY COMPUTERS LIMITED, 8. Chubb Hill Road, Whitby, North Yorks.
Telephone 0947-604966 or 604968

What will they think of next ?

```
140 IFK=0THEN220
150 IFK=9THEN190
160 IFK<10THEN250
170 J=PEEK(I)
180 L=3:GOTO260
190 K=(I)AND16
200 IFK=0THEN250
210 GOTO180
220 K=(I)AND240
230 IFK>111THEN250
240 IFK=32THEN180
250 L=2
260 N=A:GOSUB710
270 PRINT"   ";
280 IFT$(I)="?"THENL=1
290 FORX=ATOA+L-1
300 N=PEEK(X):GOSUB710:PRINT" ";
310 NEXT
320 PRINT:PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒";
330 IFT$(I)<>"?"THEN350
340 PRINT".BYT  $";:N=I:L=1:GOSUB710:GOTO620
350 PRINTT$(I);
360 IFL=1THEN620
370 PRINT"  ";
380 X=(I)AND15:Y=(I)AND240
390 IFL=3THEN530
400 ONX+1GOTO410,470,460,1120,500,
                   500,500,1120,1120,460
410 IF(Y)AND16THEN430
420 GOTO460
430 N=PEEK(A+1):IFN>127THENN=-(256-N)
440 PRINT"$";:N=A+N+2
450 GOSUB710:GOTO620
460 PRINT"#$";:N=PEEK(A+1):GOSUB710:GOTO620
470 PRINT"($";:N=PEEK(A+1):GOSUB710
480 IF(Y)AND16THENPRINT"),Y";:GOTO620
490 PRINT",X)";:GOTO620
500 PRINT"$";:N=PEEK(A+1):GOSUB710
510 IF(Y)AND16THENPRINT",X";
520 GOTO620
530 ONX+1GOTO560,10,10,10,10,10,10,10,10,540,10,10,590,550,550
540 PRINT"$";:N=PEEK(A+2):GOSUB710:N=PEEK(A+1):GOSUB710:PRINT",Y";:GOTO620
550 IFI=200THEN540
560 PRINT"$";:N=PEEK(A+2):GOSUB710:N=PEEK(A+1):GOSUB710
570 IF(Y)AND16THENPRINT",X";
580 GOTO620
590 IFI=198THEN560
600 IFI<>102THEN560
610 PRINT"($";:N=PEEK(A+2):GOSUB710:N=PEEK(A+1):GOSUB710 :PRINT")";
620 PRINT:PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒";
630 FORJ=1TOL
640 X=PEEK(A+J-1)
650 IFX<32THENX=X+32
660 IFX>127THENX=X-128:GOTO650
670 PRINTCHR$(X);:NEXT
680 A=A+L
690 PRINT:   NEXT
700 GOTO20
710 A$="0123456789ABCDEF"
720 H$=""
730 K=N-INT(N/16)*16
740 N=INT(N/16)
750 H$=MID$(A$,K+1,1)+H$
760 IFN>0THEN730
770 IFLEN(H$)=1THENPRINT"0";
780 PRINTH$;
790 RETURN
800 DATABRK,ORA,?,?,?,ORA,ASL,?
810 DATAPHP,ORA,ASL,?,?,ORA,ASL,?
820 DATABPL,ORA,?,?,?,ORA,ASL,?
830 DATACLC,ORA,?,?,?,ORA,ASL,?
840 DATAJSR,AND,?,?,BIT,AND,ROL,?
850 DATAPLP,AND,ROL,?,BIT,AND,ROL,?
860 DATABMI,AND,?,?,?,AND,ROL,?
870 DATASEC,AND,?,?,?,AND,ROL,?
880 DATARTI,EOR,?,?,?,EOR,LSR,?
890 DATAPHA,EOR,LSR,?,JMP,EOR,LSR,?
900 DATABVC,EOR,?,?,?,EOR,LSR,?
910 DATACLI,EOR,?,?,?,EOR,LSR,?
920 DATARTS,ADC,?,?,?,ADC,ROR,?
930 DATAPLA,ADC,ROR,?,JMP,ADC,ROR,?
940 DATABVS,ADC,?,?,?,ADC,ROR,?
950 DATASEI,ADC,?,?,?,ADC,ROR,?
960 DATA?,STA,?,?,STY,STA,STX,?
970 DATADEY,?,TXA,?,STY,STA,STX,?
980 DATABCC,STA,?,?,STY,STA,STX,?
990 DATATYA,STA,TXS,?,?,STA,?,?
1000 DATALDY,LDA,LDX,?,LDY,LDA,LDX,?
1010 DATATAY,LDA,TAX,?,LDY,LDA,LDX,?
1020 DATABCS,LDA,?,?,LDY,LDA,LDX,?
1030 DATACLV,LDA,TSX,?,LDY,LDA,LDX,?
1040 DATACPY,CMP,?,?,CPY,CMP,DEC,?
1050 DATAINY,CMP,DEX,?,CPY,CMP,DEC,?
1060 DATABNE,CMP,?,?,?,CMP,DEC,?
1070 DATACLD,CMP,?,?,?,CMP,DEC,?
1080 DATACPX,SBC,?,?,CPX,SBC,INC,?
1090 DATAINX,SBC,NOP,?,CPX,SBC,INC,?
1100 DATABEQ,SBC,?,?,?,SBC,INC,?
1110 DATASED,SBC,?,?,?,SBC,INC,?
1120 END
READY.
```

HINTS & TIPS

Due to popular request, here is a chart showing the equivalent locations (if any) between the three machines.

64	PET	VIC-20	DESCRIPTION
0-1			Do not mess about with these.
3-4		3-4	Float -> Integer vector.
5-6		5-6	Integer -> Float vector.
7	3	7	Search Character.
8	4	8	Quotes flag.
9		9	Position of cursor on line.
10		10	Flag. Load = 0; Verify = 1.
11	5	11	Input buffer pointer/ no. of subscripts.
12	6	12	Default DIM flag.
13	7	13	Type of variable: 255 = string, 0 = numeric.
14	8	14	Numeric type: 128 = integer, 0 = real.
15	9	15	DATA scan, LIST quote, Memory flag.
16	10	16	FNx, Subscript flag.
17	11	17	0 = input, 64 = get, 152 = read.
18	12	18	ATN sign, comparison eval flag.
19	14	19	Input prompt flag (<>0 suppress prompt).
20-21	17-18	20-21	Integer computed for GOTO, SYS, etc.
22	19	22	Pointer: temporary string stack.
23-24	20-21	23-24	Last temp string vector.
25-33	22-30	25-33	Stack for temp strings.
34-37	31-34	34-37	Utility pointer area.
38-42	35-39	38-42	Product area for multiplication.
43-44	40-41	43-44	Pointer: Start of basic.
45-46	42-43	45-46	Pointer: Start of variables.
47-48	44-45	47-48	Pointer: Start of arrays.
49-50	46-47	49-50	Pointer: End of arrays.
51-52	48-49	51-52	Pointer: String storage (moving down).
53-54	50-51	53-54	Pointer: Utility string.
55-56	52-53	55-56	Pointer: Limit of memory.
57-58	54-55	57-58	Current basic line number.
59-60	56-57	59-60	Previous basic line number.
61-62	58-59	61-62	Pointer: Basic statement for CONT.
63-64	60-61	63-64	Current DATA line number.
65-66	62-63	65-66	Current DATA address.
67-68	64-65	67-68	Input vector.
69-70	66-67	69-70	Current variable name.
71-72	68-69	71-72	Current variable address.
73-74	70-71	73-74	Variable pointer for FOR/NEXT.
75-76	72-73	75-76	Save Y-register; basic pointer save.
77	74	77	Comparison symbol accumulator.
78-83	75-80	78-83	Misc work area.
84-86	81-83	84-86	Jump vector for functions.
87-96		87-96	Misc numeric work area.
97-102	94-99	97-102	F.P. Acc #1.
103	100	103	Series evaluation constant pointer.
104	101	104	Acc #1 high order (overflow)
105-110	102-107	105-110	F.P. Acc #2.
111	108	111	Sign comparison Acc #1 vs. Acc #2.
112	109	112	Acc #1 low order (rounding).
113-114	110-111	113-114	Tape buffer length/Series pointer.
115-138	112-135	115-138	CHRGET subroutine.
139-143	136-140	139-143	RND seed value.
144	150	144	Status word.
145		145	STOP and RVS flag.
146	156		Timing constant for tape.
147	157	147	Load = 0, Verify = 1.
153	175	153	Input device (default 0).
154	176	154	Output device (default 3).
197	151	197	Current key pressed : setup varies.
198	158	198	No. or chars in keyboard buffer.
199	159	199	Screen reverse flag.
203	166	203	Copy of 197/151/197.
211	163	211	Position of cursor on line.
214	164	214	Current line number.
216	220	216	# of inserts outstanding.
217-242	224-248	217-241	Screen line link table.
243-244		243-244	Screen colour pointer.
245-246		245-246	Keyboard pointer.
247-248		247-248	Pointer: RS-232 received buffer.
249-250		249-250	Pointer: RS-232 send buffer.
251-255		251-25	Free zero page.
256-511	256-511	256-511	Processor stack area.
512-600	512-592	512-600	Basic input buffer.
828-1022	826-1017	828-1020	Cassette buffer.
1024-2023	32768-33767	7680-8186	Video RAM: PET & 64=1000 bytes; VIC=506.*)
2048	1024	4096	Start of basic program memory. (*)
55296		38400	Start of Colour ram.(*)

* NOTE that these locations for the VIC vary depending on the amount of memory expansion in place. If more than 5.5K expansion, the locations change to:

Video RAM	4096-4602
Start of basic program memory	4608
Start of Colour memory	37888.

How To Cope With VIC Memory Expansion

With more and more owners of VICs adding memory expansion to their machines, there is a great need for programs that will work on all VICs irrespective of how much memory has been added on. The trouble with the VIC is that once the size of its memory becomes greater than 8K, some very important locations and values change which makes using a VIC very tedious. You either have to go through changing the values in the program or switch off and remove the expansion.

With a few lines of a Basic program, however, this problem can be overcome. The easiest method is to have a routine that can check to see if there is more than 8K of memory on board. This cannot be done just by testing FRE(0) as it must be remembered that your own program is also in memory. The better way is just to test where the start of basic programming memory is and choose the variables from that.

The two locations in question are: 43 & 44. To find out where the start of programming memory is, PEEK(43)+PEEK(44)*256-1.

Now to put that into a program:

```
10 MEM=PEEK(43)+PEEK(44)*256: REM START OF BASIC MEMORY
20 IF MEM <> 4608 THEN 60: REM LESS THAN 8K
30 SCR=4096: REM START OF VIDEO SCREEN
40 COL=37888: REM START OF COLOUR MEMORY
50 GOTO 80
60 SCR=7680
70 COL=38400
80 REM CONTINUE WITH YOUR OWN PROGRAM
```

With this at the beginning of your programs, all that is needed when POKEing to either the screen or the colour memory is to always reference it with the start plus an offset.

VIC 20 GAMES

SOFTWARE FROM AMERICA

FROM **£2.65** EACH IN SIX PAC

FROGGER. Incredible animation in this high performance graphics experience. Frogs, trucks, cars, boats, logs, turtles and lilypads all combine to give your brain a real workout. **£4.95.**

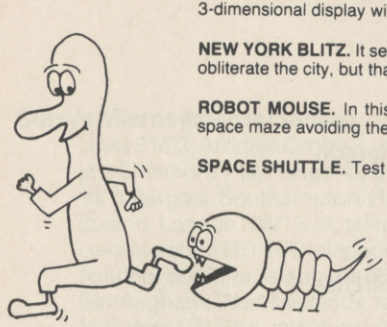
3D MAZE. The ultimate maze game features brain power not fire power. A visually breath-taking 3-dimensional display with a tormenting time factor as the 4th dimension. **£4.75.**

NEW YORK BLITZ. It seems a shame that the only way to safely land your nuclear bomber is to totally obliterate the city, but that's the way it goes. **£4.95.**

ROBOT MOUSE. In this futuristic homicidal game you collect atomic cheese from the floor of the space maze avoiding the mean malfunctioning androids who kill on contact. **£4.50.**

SPACE SHUTTLE. Test your reflexes to the maximum as you attempt to rescue dumb scientists from the lunar surface. Beware of the exploding asteroids in this hectic challenge. **£4.50.**

BUG DIVER. In this highly original game, as a mere beetle you've gotta be fast to avoid the angry carnivorous fish whilst stealing their precious eggs. Their favourite meal is raw beetle. So watch out! **£4.75.**



INTRODUCTORY OFFER

Any 2 games £7.90
Any 4 games £12.95

ALL 6 GAMES £15.90
(That's only £2.65 each!)

MONEY BACK GUARANTEE

NOW FOR THE FIRST TIME IN UK.....

Six famous arcade quality games use machine code, Hi-res multi-color grafix, exciting sound effects, for any VIC-20, keyboard or joystick.

Available now in UK direct from manufacturer only thru our **super fast mail order service**, or 24hr credit card sales line. All games supplied on cassette with written money back guarantee.

Galactic Software

LAMBROOK RD. SHEPTON BEAUCHAMP. SOMERSET. TA19 0LZ

Please rush me copies of (tick box) CCII
☐ FROGGER ☐ ROBOT MOUSE
☐ 3-D MAZE ☐ SPACE SHUTTLE
☐ NEW YORK BLITZ ☐ BUG DIVER
I enclose a cheque/PO for £..........
Please debit my Access account card no. ....
Name..........
Address..........
....
....

Tel: 0460 40744

Vizawrite 64

OUR PRICE ONLY £52+VAT!

Designed especially for the CBM 64, VizaWrite 64 is a high-performance, low-cost word processor, with on-screen formatting, taking full advantage of the 64's colour, graphics and memory features... VizaWrite 64 supports virtually any printer (no interface required for parallel printers!) and can even read files from Wordpro, Wordcraft or Silicon Office... Supplied with a comprehensive and easy-to-follow user manual, VizaWrite offers the ultimate in personal computer word processing! VizaWrite is also available on CARTRIDGE (our price only £59+Vat!), and both versions support a tape cassette! VizaWrite can also be supplied in combination with VizaSpell (our price only £72+Vat!).

VizaSpell 64

OUR PRICE ONLY £42+VAT!

VizaSpell 64 is the companion spelling checker to use with VizaWrite. With its 30,000 word disk-dictionary, VizaSpell works to the same high standard and ease of use as VisaWrite, offering ON-LINE spelling checking, WITHOUT the need for frequent disk-changes! VizaSpell takes on average just FOUR minutes to spell-check any document against its massive dictionary and new words can be added... AND you can search for word patterns!

VizaWrite and VizaSpell are just two products from our range of CBM software. Please phone or write for a free catalogue! ORDERING INFORMATION: ADD 15% VAT TO QUOTED PRICES & ORDER BY POST/TELEPHONE/PRESTEL, USING CHEQUE, ACCESS, BARCLAY CARD OR OFFICIAL ORDER. TELEPHONE 01-546-7256 FOR SAME-DAY DESPATCH. POSTAGE FREE EXCEPT ON CREDIT OR OVERSEAS ORDERS. (REF A17)

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY KT2 7QT TEL 01-546-7256

Master 64

INTRODUCTORY OFFER PRICE £125 + VAT!

MASTER is a totally new concept... a complete program development package! Available NOW for the CBM 64, Master has 85 new commands... AND Basic IV too! PLUS Toolkit functions, Business Basic, keyed disk access, screen management, user-definable input zones, report generator, 22-place decimals, date control, disk data compression, string search, screen plotting, screen dump, optional software protection key, and more... Master 64 supports the CBM 1541 disk (also CBM disks 4040 to 9090 with its optional IEEE interface) and is supplied with an indexed User Reference Manual, Quick Reference Guide and demo programs. MASTER IS ALSO AVAILABLE FOR CBM MODELS 4032/8032/8096, AND CBM 700!

PM 96

ONLY £99.50 PLUS VAT!

Unleash the full power of your CBM 8096, with PM96... the only product to provide sophisticated yet simple dynamic memory management... AND Toolkit commands... AND Extended Basic! PM96 offers a multi-program user memory of no less than 82K, with 56K for programs and 26K for variables. PM96 is supplied with a full User Reference Manual, Quick Reference Guide, program disk with demo, and UD11 Support Rom.

Master and PM96 are just two products from our range of fine CBM software... please phone or write for a free catalogue! ORDERING INFORMATION: ADD 15% VAT TO QUOTED PRICES & ORDER BY POST/TELEPHONE/PRESTEL, USING CHEQUE, ACCESS, BARCLAY CARD OR OFFICIAL ORDER. TELEPHONE 01-546-7256 FOR SAME-DAY DESPATCH. POSTAGE FREE EXCEPT ON CREDIT OR OVERSEAS ORDERS. (REF A16)

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY KT2 7QT TEL 01-546-7256

Dealer Directory For The 20, 64 And 700

Alpha Business Systems,
Electron House, Industrial Estate, Church Street, Ware, Herts. SG12 9ES, telephone 0920 68926/7.
Avon Business Computers Limited,
192 Wells Road, Bristol, Avon BS4 2AX, telephone 0272 779452/3.
Alphascan,
22 Hambridge Road, Newbury, Berkshire RG14 5SU, telephone 0635 30880. Also at Little Bourton House, Southam Road, Banbury, Oxfordshire, telephone 029575 8202.
Adda Computers Limited,
National Electronics Centre, London World Trade Centre, Europe House, East Smithfield, London E1 9AA, telephone 01-488 2400. Also at Mercury House, Hanger Green, Ealing, London W5 3BA, telephone 01-997 6666.
Arden Data Processing,
166 Park Road, Peterborough, Cambridgeshire PE1 2UF, telephone 0733 47767.
AOM Business Systems Limited,
LVE Buildings, Jarrom Street, Leicester, Leicestershire, telephone 0533 548923.
Ackroyd Typewriter and Adding Machine Company Limited,
57/59 Leeds Road, Bradford, Yorkshire BD1 5AF, telephone 0274 731835/732243/309596.
Automated Business Equipment Limited,
Mersey House, Battersea Road, Heaton Mersey Industrial Estate, Stockport, Cheshire SK4 3EA, telephone 061 432 0708/432 4299/431 7192.
Ayrshire Office Services Limited,
22 Douglas Street, Kilmarnock, Strathclyde KA1 1RB, telephone 0563 24255.
AC Systems,
6 Cathedral Lane, Truro, Cornwall TR1 2QS, telephone 0872 79727. Also at 13 Heavitree Road, Exeter, Devon EX1 2LD, telephone 0392 211718. Also at 75 Mutley Plain, Plymouth, Devon PL4 7DS, telephone 0752 260861.
Amplicon Micro Systems Limited,
Richmond Road, Brighton, East Sussex BN2 3RL, telephone 0273 608331.
AJR Computer Systems Limited,
80 Nottingham Road, Arnold, Nottingham NG5 6LF, telephone 0602 206647/204001.
Aughton Micro Systems,
29 Woodward Road, Kirkby Industrial Estate, Kirkby, Merseyside, telephone 051 548 7788.
Apollo Reprographics,
15a West Station Industrial Estate, Spital Road, Maldon, Essex CM9 6TW, telephone 0621 56933.
Business Electronics,
Rownhams House, Rownhams, Southampton, Hampshire S01 8AH, telephone 0703 738248/739092.
Betos (Systems) Limited,
Bennett House, 155 Mansfield Road, Nottingham, Nottinghamshire NG1 3FR, telephone 0602 418108.
BER Limited,
Grosvenor House, Grosvenor Road, Coventry, West Midlands CV1 3FF, telephone 0203 20246. Also at 99 Albert Street, Rugby, Warwickshire CV21 2SW, telephone 0788 65756.
B&B Computers Limited,
118 Newport Street, Bolton, Lancashire BL3 6AB, telephone 0204 382741.
Brent Computer Systems,
33 Church Street, Rickmansworth, Herts. WD3 1DH, telephone 0923 771306.
Cotswold Computer Services Limited,
Computer Centre, Station Road, Yate, Bristol BS17 5HG, telephone 0454 322440.

Dealer Directory For The 20, 64 And 700

Currys Microsystems Limited,
Units 91/93, Arndale Centre, Luton, Bedfordshire LU1 1TB, telephone 0582 425079. Also at 2 Channons Hill, Fishpond, Bristol, Avon BS16 2EA, telephone 0272 650501. Also at 10/11 Bargate, Southampton, Hants. telephone 0703 29676. Also at 23 Hampstead Road, Euston, London NW1 3JA, telephone 01-387 9275. Also at 127 Charles Street, Leicester, Leicestershire LE1 11R, telephone 0533 546224. Also at 2 Wheeler Gate, Nottingham, Nottinghamshire, telephone 0602 412455. Also at 5/11 Martineau Way, Union Street, Birmingham, West Midlands, telephone 021 233 1105. Also at 57/59 Albion Street, Leeds, Yorkshire LS1 5AA, telephone 0532 446601. Also at 19 Brown Street, Manchester M2, telephone 061 834 0144.

Computacenter Limited,
Theatre Square, Swindon, Wiltshire SN1 1QN, telephone 0793 612341/2.

CSE (Computers),
12 Wokingham Road, Reading, Berkshire RG6 1JG, telephone 0734 61492.

CSS Systems Limited,
502 Kingsland Road, London E8 4AE, telephone 01-254 9293/1674.

Chromasonic Electronics,
48 Junction Road, Archway, London N19 5RD, telephone 01-263 9493/9495.

Cavendish Data Systems,
74 Portland Road, South Norwood, London SE25, telephone 01-656 8941.

Capital Computer Systems Limited,
32 Windmill Street, London W1P 1HH, telephone 01-636 3863.

Consyst Computer Services Limited,
1 Maris Lane, Trumpington, Cambridge CB2 2LN, telephone 0223 841997.

Computer Services Midland Limited,
Dunlop India House, Abbeyfield Road, Lenton Industrial Estate West, Nottingham, telephone 0602 412455. Also at Refuge Assurance House, Sutton New Road, Erdington, West Midlands B23 6QX, telephone 021 382 4171.

Catlands Information Systems Limited,
8 Charlotte Street West, Macclesfield, Cheshire SK11 6EF, telephone 0625 613375.

Currie and Maughan Microcomputers,
204/206 Durham Road, Gateshead, Tyne & Wear NE8 4JR, telephone 0632 815157.

Commodore (Concessionaires) Ireland Limited,
Barton House, Francis Street, Galway, Eire, telephone 091 67156.

Computer Supplies (Swansea),
82 Gower Road, Sketty, Swansea, West Glamorgan SA2 9BZ, telephone 0792 290047.

Computer Sales and Software Centre Limited,
190/192 Cranbrook Road, Ilford, Essex IG1 4LU, telephone 01-554 3344.

Camden Computer Systems Limited,
462 Coventry Road, Small Heath, Birmingham, West Midlands B10 0UG, telephone 021 771 3636.

Criffel Micro Cumbria,
22 Lowther Street, Carlisle, Cumbria CA3 8DA, telephone 0228 44044.

Cytek (UK) Limited,
Sandringham House, 9 Warwick Road, Old Trafford, Manchester M16 0QQ, telephone 061 872 4682.

Computers and Business Systems,
89 Manchester Road, Nelson, Lancashire BB9 7HB, telephone 0282 601191.

Devon Computers (North),
Seven Brethren Bank, Barnstaple, Devon EX31 2AS, telephone 0271 74478.

Devon Computers,
The White House, 39 Totnes Road, Paignton, Devon TQ4 5LA, telephone 0803 526303.

Deane Computer Services,
Sea Road North, Bridport, Dorset DT6 3BD, telephone 0308 25276.

Dealer Directory For The 20, 64 And 700

DDM Direct Data Marketing Limited,
22 Warley Hill, Brentwood, Essex CM14 5HA, telephone 0277 229379/214168/230480.
Also at 86/87 Wilton Road, Central London SW1V 1DN, telephone 01-834 5016/5096.

Datalect Computers Limited,
7 St. Georges Walk, Croydon, Surrey CR0 1YH, telephone 01-680 3581. Also at 33/35
Portugal Road, Woking, Surrey GU21 5JE, telephone 04862 25995.

Davinci Computer Shop,
65 High Street, Edgware, Middlesex HA8 7DD, telephone 01-952 0526.

Dataview Limited,
Portreeves House, East Bay, Colchester, Essex CO1 2XB, telephone 0206 865835.

Davidson-Richards Limited,
29 Charnwood Street, Derby, Derbyshire DE1 2GU, telephone 0332 548923.

Deans Comuter Services Limited,
Sheepscar House, Sheepscar Street South, Leeds, West Yorkshire LSY 1AD, telephone
0532 452966.

D. Kipping Limited,
The Systems Centre, Chester Street, Chestergate, Stockport, Cheshire SK3 0BQ,
telephone 061 477 3880.

Datel Computing Limited,
323 Clifton Drive, Lytham St. Annes, Lancashire FY8 1HN, telephone 0253 727051.

Executive Reprographic and Business Consultants Limited,
2/4 Oxford Road, Manchester, Greater Manchester M1 5QA, telephone 061 228 1637.

Gate Microsystems Limited,
Abbey House, 10 Bothwell Street, Glasgow G2 6NU, telephone 041 221 9372. Also at The
Nethergate Centre, 35 Yeaman Shore, Dundee DD1 4BU, telephone 0382 28194.

HB Computers Limited,
40/50 Collingdon Street, Luton, Beds., telephone 0582 454466. Also at 104 St. James
Road, Northampton, telephone 0604 56544. Also at 20/22 Station Road, Kettering,
Northants, telephone 0536 520910.

Holdene Limited,
Bray House, Leicester Place, Leeds LS2 9BH, telephone 0532 459459. Also at Hesketh
House, 47 Water Lane, Wilmslow, Cheshire SK9 5BB, telephone 0625 615375. Also at 48
Great King Street, Edinburgh EH3 6QY, telephone 031 557 4060.

Holbrook Business Systems Limited,
Moss House, High Street, Mosborough, Sheffield, South Yorkshire S19 5AE, telephone
0742 484466.

Ibek Systems,
437 Stoney Stanton Road, Coventry, West Midlands CV6 5EA, telephone 0203 661162.

Intex Datalog Limited,
Eaglescliffe Industrial Estate, Eaglescliffe, Cleveland TS16 0PN, telephone 0642 781193.

JM Computer Services Limited,
14/15 Lemon Street, Truro, Cornwall TR1 2QS, telephone 0872 70071/71626.

JAD Integrated Services (Plymouth) Limited,
32 Western Approach, City Centre, Plymouth, Devon PL1 1TQ, telephone 0752
29038/662616.

Jentech Services Limited,
Rosemary Cottages, Nordley, Bridgnorth, Shropshire WV16 4SU, telephone 07462 5287.

JM Computers,
136 Park Lane, Whitefield, Manchester, Lancashire M25 7PY, telephone 061 796 5677.

Kingsley Computers Limited,
132 Desborough Road, High Wycombe, Bucks. HP11 2PU, telephone 0494 449749.

Key Computer Services Limited,
Osborne House, Osborne Road, Jesmond, Newcastle upon Tyne, Tyne and Wear,
telephone 0632-815157.

L&J Computers,
192 Honeypot Lane, Queensbury, Stanmore, Middlesex HA7 1EE, telephone 01-204
7525.

Dealer Directory For The 20, 64 And 700

MOS Computers,
80 Colston Street, Bristol, Avon BS1 5BB, telephone 0272 279318.

Milequip Computers,
7 Hare Lane, Gloucester GL1 2BA, telephone 0452 411010.

Microchips,
46/48 St. Georges Street, Winchester, Hants. SO23 8BE, telephone 0962 68085.

Micro-Facilities Limited,
7/9 Church Road, Egham, Surrey TW20 9QL, telephone 0784 31333.

Merchant Systems Limited,
5 New Bridge Street, London EC4V, telephone 01-583 6774.

Micro Computation,
8 Station Parade, Southgate, London N14 5BL, telephone 01-882 5104.

Missing Link Computers Limited,
Abacus House, 53/55 Ballards Lane, Finchley, London N3, telephone 01-349 4711/4969

Micro Computer Centre,
28 Sheen Lane, London SW14 8LW, telephone 01-878 7044.

MMS Limited,
Ketwell House, 75/79 Tavistock Street, Bedford MK40 2RR, telephone 0234 40601.

McDowell Knaggs Associates Limited,
Shades House, Mealcheapen Street, Worcester, Worcs. WR1 2DQ, telephone 0905 612261.

Microtrading Limited,
641 Bromford Lane, Ward End, Birmingham B8 2EP, telephone 021 784 0077.

Micro Business Centre Limited,
Wolverhampton Computer Centre, 17/19 Lichfield Street, Wolverhampton, West Midlands, telephone 0902 29021/29907.

Micro Associates,
471 Lichfield Road, Aston, Birmingham, West Midlands B6 7SP, telephone 021 328 4575.

Microrose Limited,
Main Street, High Bentham, Lancaster LA2 7HJ, telephone 0468 62180.

Mipac Services,
St. Leonards House, St. Leonardgate, Lancaster, Lancashire LA1 1NN, telephone 0524 62033.

Microprocessor Services,
77a Beverley Road, Hull, North Humberside HU3 1XR, telephone 0483 562107.

Microwave Computers Limited,
Priory House, 1133 Hessle High Road, Hull, North Humberside HU4 6SB, telephone 0482 562107.

Microcom,
Fortune House, 74 Waterloo Street, Glasgow G2, telephone 041 204 0812.

Mac Micro,
Beaufort House, The Square, Beauly, Inverness IV4 7BX, telephone 0463 782774.

North West Business Machines Limited,
Curate Street, Great Harwood, Blackburn, Lancashire BB6 7DB, telephone 0254 888125.

Newcastle Computer Services Limited,
906/908 Shields Road, Walkergate, Newcastle upon Tyne NE6 4QP, telephone 0632 761168/9.

Northern Ireland Computer Centre Limited,
4 High Street, Holywood, Co. Down, N. Ireland, telephone 02317 6548.

Oxford Business Computers Limited,
7/8 Park End Street, Oxford OX1 1HH, telephone 0865 249898.

Office and Business Equipment,
Executive House, Pierce Street, Queensferry, Deeside, Clwyd CH5 1SY, telephone 0244 816803.

Photo Acoustics Limited,
255a St. Albans Road, Watford, Herts. WP2 5BQ, telephone 0923 40698.

PPM Limited,
Heritage Road, St. Johns, Woking, Surrey GU21 1TZ, telephone 04867 80111.

Dealer Directory For The 20, 64 And 700

Preston Computer Centre,
6 Victoria Buildings, Fishergate, Preston, Lancashire PR2 4FG, telephone 0772 57684.
Radan Computational Limited,
19 Belmont, Lansdown Road, Bath, Avon BA1 5DZ, telephone 0225 332311.
Rockliff Microcomputers Limited,
2 Rumford Street, Liverpool, Merseyside L2 8SZ, telephone 051 227 7788. Also at Pendre House, High Street, Mold, Clwyd, telephone 0352 59629.
Robox OE Limited,
Units 14/15, Anderston Centre, Argyle Street, Glasgow G2 7PH, telephone 041 221 8413/4.
Reeves Computers Limited,
6 Walter Road, Swansea, West Glamorgan SA1 5NF, telephone 0792 468103. Also at 33 Bridge Street, Newport, Gwent NPT 4BH, telephone 0633 212331. Also at 24 Spilman Street, Carmarthen, Dyfed SA31 1LQ, telephone 0267 32441/2.
South Coast Computers,
South Coast House, Wimborne Road, Ferndown, Dorset BH22 9NG, telephone 0202 893040.
Somerset Business Computers,
25 East Reach, Taunton, Somerset TA1 3EP, telephone 0823 52149.
South East Computers Limited,
Unit 2, Castleham Road, Castleham Industrial Estate, Hastings, East Sussex, telephone 0424 426844. Also at Westbrook House, Albion Place, Maidstone, Kent, telephone 0622 681263.
Stuart R. Dean Limited,
373 Southchurch Road, Southend on Sea, Essex SS1 2PY, telephone 0702 62707.
Sumlock Bondain Limited,
263/269 City Road, London EC1V 1JX, telephone 01 250 0505. Also at Shop 2, Cannon Street Station, Cannon Street, London EC4, telephone 01 626 0487. Also at 32 Prince of Wales Road, Norwich, Norfolk, NR1 1LG, telephone 0603 26259/614302.
Sheffield Computer Centre,
Computer Centre (Sheffield) Limited, 227 London Road, Sheffield, South Yorkshire S2 4NE, telephone 0742 53519/588731
Stack Computer Services Limited,
290/298 Derby Road, Bootle, Liverpool, Merseyside L20 8LN, telephone 051 933 5511
Sigma Systems Limited,
266 North Road, Gabalfa, Cardiff, South Glamorgan CF4 3BL, telephone 0222 34869/34865/25800.
The Computer Shack,
14 Pittville Street, Cheltenham, Gloucestershire GL52 2LJ, telephone 0242 584343.
The Slough Micro Shop,
120 High Street, Slough, Berkshire SL1 1JQ, telephone 0753 24001.
The Computer Room,
87 High Street, Tonbridge, Kent TN9 1RX, telephone 0732 355962.
Taylor Wilson Systems Limited,
Oakfield House, Station Road, Dorridge, Solihull, West Midlands B93 8HQ, telephone 05645 6192.
The Computer Supermarket (Manchester) Limited,
Knightsbridge Mall, Arndale Shopping Centre, Manchester, telephone 061 834 1116.
Vision Store Limited,
3 Eden Walk Precinct, Kingston upon Thames, Surrey KT1 1BP, telephone 051 546 8974
Wego Computers Limited,
22a High Street, Caterham, Surrey CR3 5UA, telephone 0883 49235. Also at 3 Wadsworth Road, Perivale, Greenford, Middlesex UB6 7JD, telephone 01 998 9011
Walters Computer Systems Limited,
57 High Street, Stourbridge, West Midlands DY8 1DE, telephone 0562 70811
Yorkshire Electronics,
Caxton House, 17 Fountain Street, Morley, West Yorkshire LS27 9AE, telephone 0532 522181.
Yorkshire Microcomputers Limited,
28 Ramshill Road, Scarborough, North Yorkshire YO11 2QF, telephone 0723 78136.

microfacts

Integrated Accounting System

One of the premier accounting packages available for Commodore business systems.

Sales Invoicing

Sales Ledger

Nominal Ledger

Purchase Ledger

Stock Control

and

Job Costing

- **Modular** – You choose which combination you need
- **Fully Integrated** – All postings made from a single entry
- **Requires only two disks** – No complicated disk changing
- **Large volumes** – Several thousand accounts/stock items/transactions
- **Multi-company** – Up to 5 companies accounts on 2 disks
- **Multi-ledger** – Up to 5 sales/purchase ledgers per company

Simple to learn and operate, robust and safe to use, well proven – 700 + live installations – 3 years development and sale worldwide – commodore approved product for 2 years, approved and used by professional accountants. Fully approved by H.M.C. & E. for V.A.T.

Available on 8032/8096 computers
8050/8250 disk drives
Any printer

Price £300.00 per module

Also available on the new CBM 700 Series

Facts Software Ltd
Ketwell House, 75-79 Tavistock Street
Bedford MK40 2RR. Tel: 0234 218191
For further information and details of your local dealer

commodore

Superbase
Superoffice
Superscript II
Superspell

Driving Commodore is getting easier

Steer your way to greater efficiency and meet all your administrative needs of the future with the SUPER range of quality software.

Whether you want a fast and flexible database, a comprehensive and easy to use word processor, or a completely integrated office 'manager', Precision Software has the answer. With software that harnesses the full power of the new 700 business computer from Commodore.

Superbase Database manager for all business environments where accurate and up-to-date information is the key to success.

SUPERBASE sets new standards in flexibility and ease of use, with large record sizes, fully re-definable multi-screen record formats, spreadsheet-like calculation facilities, fast 'B+ tree' keyaccess with selective retrieval, transaction linking, sorting and fully definable report formats. SUPERBASE can also be linked to SUPERSCRIPT II.

Superscript II Enhanced version of the popular full feature word processor. Unrivalled table handling with 240 column wide screen, scrolling in all directions, arithmetic, memory calculator, column manipulation and mail merge with record selection. Comprehensive editing and finish quality output formatting. Handles up to 2,100 lines of 80 column text. And it spells!

Versatile, fast, simple to learn and use, SUPERSCRIPT II processes letters, quotations, reports, mailshots and standard forms with professional ease, enhancing presentation and ensuring perfect copies every time.

Superspell Fast, effective spelling checker ensures 100% typographic accuracy. An integral part of SUPERSCRIPT II, SUPERSPELL checks documents against a standard 30,000+ word dictionary and displays a list of every unrecognised word. SUPERSPELL handles both English and American spelling variants. You can accept, ignore, correct or add new words, building up your own dictionary extension. SUPERSPELL also includes a word look-up facility.

Superoffice The ultimate integrated office administration system, with full records management, calculation, word processing and spell checking.

SUPEROFFICE combines the database handling of SUPERBASE with the document editing and formatting power of SUPERSCRIPT II.

The availability of SUPERSCRIPT II as an integral word processor enables lists selected from data files to be used for mailshots, tables, standard forms and labels. SUPEROFFICE includes a powerful programming capability, enabling you to build up a library of your own programs. System-wide help screens are supported by clear comprehensive manuals and tutorials.

Choose an off-the-shelf application to suit your business from a steadily expanding library.

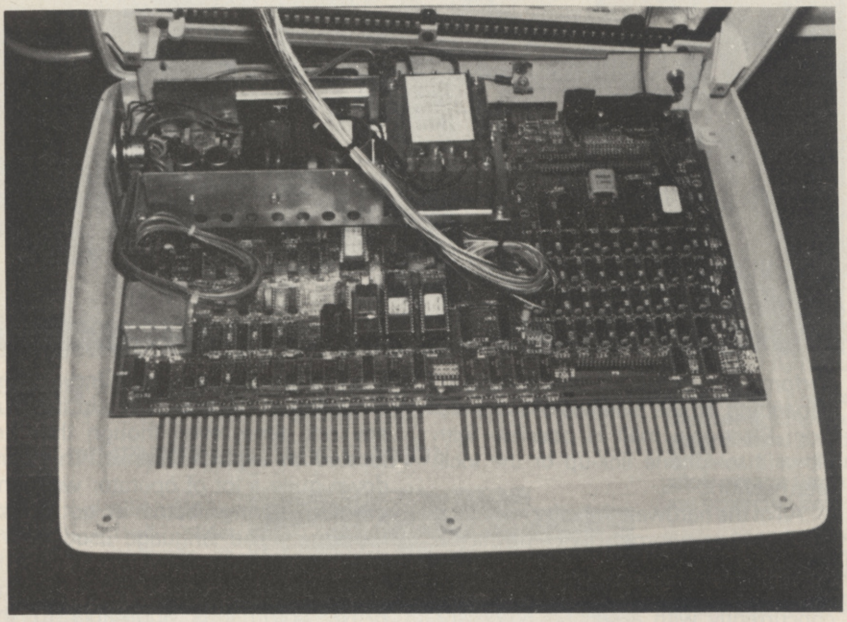
OFFICIALLY APPROVED BY COMMODORE

Precision Software

Precision Software Limited
Park House, 4 Park Terrace,
Worcester Park, Surrey, KT4 7JZ.
Telephone: 01-330 7166
Telex: 8955021. PRECIS G

The 700 was reviewed at the premises of Precision Software, Park House, 6 Park Terrace, Worcester Park, Surrey KT4 7QX, telephone 01-330 7166.

The 700 is Commodore's revamped and relaunched handsome computer for business use. Designed with the user in mind, it incorporates high technology with modern styling. But it has had its problems. After many false starts and numerous problems, the Commodore 700 is just about ready for release, which should please all those many people who form the waiting list for the machine. Will it match up to everybody's business expectations?



That all depends on which particular model you set get because you can have the keyboard with or without the integral monitor. Reading through any literature produced by Commodore on the 700, the prospective user would think that Commodore had 'invented' the detachable keyboard from their own initiative and while this is a nice feature it is also a very necessary one. To sell machines within the EEC, Commodore must abide by EEC regulations and having a detachable keyboard is one of them.

On its own, the keyboard looks very similar to the 500. The styling is the same as well as the layout of the keyboard. It is, as usual, a Qwerty designed keyboard with the full 94 keys including two non-standard characters. The first of these can be found in the bottom right hand corner of the main character set and, at first, appears to be a useless piece of decoration. This is the Commodore logo and it does have a couple of uses. The first is to enable the machine's graphic capabilities but since this has been made largely redundant by the use of the control key, its major use now lies in stopping and starting listings.

In the right hand corner of the numeric keypad, there is another strange looking key, this being the 00. This is one of the newer features which actually does serve a better purpose as a piece of decoration than a useful character. What does this little oddity do? Its function is to reduce the work of the operator when entering in line numbers or data like 100. Instead of having to press the single 0 key twice to enter 100, all the operator has to do is hit the 00 key once.

Still on the keyboard, there are the 10 function keys which are of course user definable with regards to the functions they can perform which are situated across the top of the keyboard along with the four cursor keys for the horizontal and diagonal movement of the cursor. Separated above the remainder of the keyboard are the four critical operating keys CLR/HOME, OFF/RVS, NORM/GRAPH and RUN/STOP so that they are not pressed inadvertently. The RUN/STOP key has two functions. When it is unshifted it halts the execution of a program and when it is shifted it will cause the computer to automatically run and load the first program from the diskette. Generally, the keyboard, which incorporates enough space in front of the keys to act as a convenient and comfortable rest for your hands, is well thought out with the name of the game being ease of operation.

Located at the back of the machine is the reset switch, RS232C port, video port, cassette port, cartridge slot, audio output, IEEE 488 port, on/off switch and the power connector (the power source is 240V AC mains adaptor).

With the integral monitor attached – which can be swivelled from side to side and tilted up and down for more comfortable viewing – the whole machine looks very modern and stylish. Screen display on the 700 is provided via a 9 by 14 pixel format 240 colums wide. Because you can only see a screen display of 80 colums by 25 lines, it's

C.B.M. 700 REVEALED

Shown here, on the right, the Commodore 500, and on the left the new 700.

Note the detachable keyboard

impossible to see all of the 240 columns on one screen unless you make use of the scroll feature.

The characters are displayed in screen phosphor on a very dark background. This is itself is a small joy to see because it enhances the quality of the display and brings that little bit more clarity and sharpness to the whole screen making it easy to read and relaxing on the eye. However, should you want the display to be otherwise, all you have to do is press the reverse key and the display switches from the standard display to a 'negative image,' that is black characters on a green background. To prevent glare, the screen has been coated with an anti-glare solution.

Just above the attached keyboard and below the integral monitor, are the integral direct memory access disk drives which have a capacity of up to 680K. However, these are not a standard feature on all models and several other options are available. For instance you could have disk units with one or two drives to fit 5¼" diskettes with a capacity of up to 2050K or single 5 ¼" Winchester drives with a capacity of up to 7500K. On the printing side of things, there are several printers that are compatible, these being either the bi-directional dot matrix with a speed of either 60 or 150 characters per second or the bi-directional daisy wheel printer with a speed of 40 characters per second.

The 700 series has a built-in capacity for connecting to local area networking and thus allows for shared peripherals such as hard disks and printers. With this in mind, communication can also be performed over the telephone modem depending on the distance of transmission. Electronic mail is possible with either a telephone link-up or the local area network.

All of the hardware is built around the MOS 6509 microprocessor chip which is standard on all machines. This chip has been designed so that it can run concurrently with a second processor, bamely the Z80 or 8088.

It is the 6509 chip that handles all the input/output, the screen and keyboard responses and the second processor takes care of all the operational computing. It is also worth noting that it is the second processor which also allows for other operating systems such as CP/M and MS-DOS. Following this through to its logical conclusion, this means that other soft loaded languages such as FORTRAN and COBOL and available options, expanding the range of software available for the 700. Whereas CP/M will run with both the Z80 and the 8088, MS-DOS will only run with the 8088.

The standard Random Access Memory area is either 128K or 256K although add-ons enable the RAM area to be expanded to 896K. RAM is made up of a configuration of three banks, each bank having 64K although the 700 without the integral monitor has just the one bank. One bank can be used for BASIC programs while the others could be utilised for data storage. There is no such restriction for machine code. All the bank switching is handled automatically by the CPU.

The advantage of having the three banks is that any operator can continually switch from bank to bank and work on a maximum of three different items at any one time, even though they are located in separate banks. That cuts down quite a lot of operator work and the time-saving factor is not to be dismissed. The language used by the machine is of course a built-in BASIC interpreter with BLOAD, BSAVE and BANK commands applicable to the three banks. Other recognised system commands are: LOAD, SAVE, RUN, DLOAD, STOP, END, CONT, PEEK, POKE, WAIT, SYS and USR. Along with this there are also the usual set of commands for editing, formatting, arrays, strings, input, output, program flow and file commands. The program flow commands include the IF … THEN … ELSE which accounted for one of the new problems associated with the earlier set of ROM chips. The latest problem that has now been corrected concerned a faulty patch in the kernel which affected the video chip when printing characters. The problem was peculiar to machine code only in that it caused the screen to flash continually when printing reversed out characters. This should not affect the average BASIC programmer.

Even though this problem has now been overcome, some software houses may still encouter difficulties regarding the ROM chips. Software written using the old chips may not run initially once the new chips have been installed. This is because in the current set of chips now being issued by Commodore, the code for the machine code language has been changed as well as the address for some of the routines resident in the old ROM

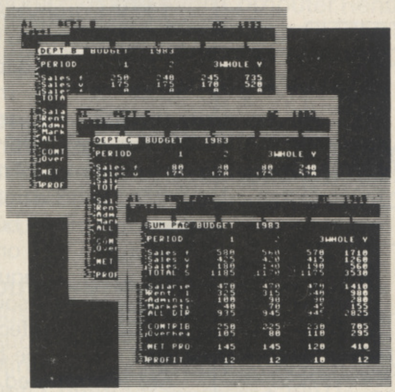
Simplify all your work with numbers -

CalcResult™

The 3 dimensional program that's a hit with users all over the world!

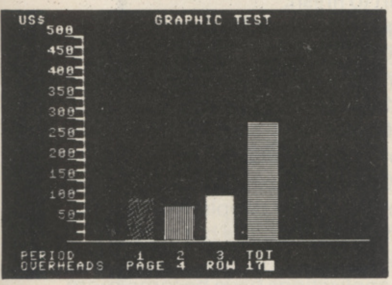
Only CalcResult gives you all these exciting features . . .

● THREE DIMENSIONAL CALCULATION



CalcResult's powerful three dimensional spread sheet format rapidly becomes an irreplaceable tool for those involved in figure manipulation and relationship. Budgets reports, statements, forecasts and planning are all areas in which a saving in time and resources are as important as the ability to handle all forms of calculations. The many features of CalcResult simplify the rapid production and calculation of all aspects of business forecasting and planning. Each model can have up to 32 pages of associated information with a consolidated report and every page has 63 × 254 data positions which can contain text, formulas or values. CalcResult's powerful editing functions mean rapid creation and amendment of models and, once created, split screens and multiple page viewing allow easy review of information.

● GRAPHIC REPRESENTATION



CalcResult can translate rows of columns of numbers into histograms on the screen or printed histograms can be used to enhance presentation of tabular information in reports. (With CalcResult 64 full colour options are available on the screen.)

● HELP FUNCTION AND AN EXPLICIT MANUAL

CalcResult is simple to use and easy to learn thanks to a detailed instruction manual and help screens that are available at the touch of a button, to explain the functions available for each command.

● FLEXIBLE PRINTING

CalcResult allows you to define your own report layout. You can choose the order of columns to be printed and set the width of each independently. Layout definitions can be stored on a disk for future use.

● TIME SAVING COMMANDS AND CONDITIONAL FUNCTIONS

Commands like replicate, copy, move, go to, insert and delete make CalcResult simple and easy to use. CalcResult calculates according to correct mathematical priority and has standard functions for statistics, trigonometry and logarithms. Conditional functions like IF THEN ELSE and OR AND NOT allow greater flexibility in the setting up of models. Once created, all formulas are protected from accidental deletion.

CalcResult is available for the business and home user . . .

Advanced CalcResult, with the three dimensional capability, is available for the Commodore 700, 8000 and 64 computers—with a disk drive. A special home or small business version, Easy CalcResult 64, is available as a cartridge. Because this does not require a disk drive the three dimensional, graphic and help function features are not available but even so Easy CalcResult 64 is as powerful as the traditional spread sheets previously only available on expensive business micro computers.

PRICES: EASY CALCRESULT 64 £69 ADVANCED CALCRESULT 64 £109 CALCRESULT 8000 £199 CALCRESULT 700 £225 ALL PRICES PLUS VAT

CalcResult is only available from

KOBRA

MICRO MARKETING OR THEIR DEALERS

Kobra Micro Marketing,
P.O. Box 28,
Henley-on-Thames, Oxon.
Telephone
(04912) 2512/77654.

SEND IN THIS COUPON NOW FOR DETAILS

To: Kobra Micro Marketing, P.O. Box 28, Henley-on-Thames, Oxon.

Please send details of the exciting CalcResult program. I am interested in:

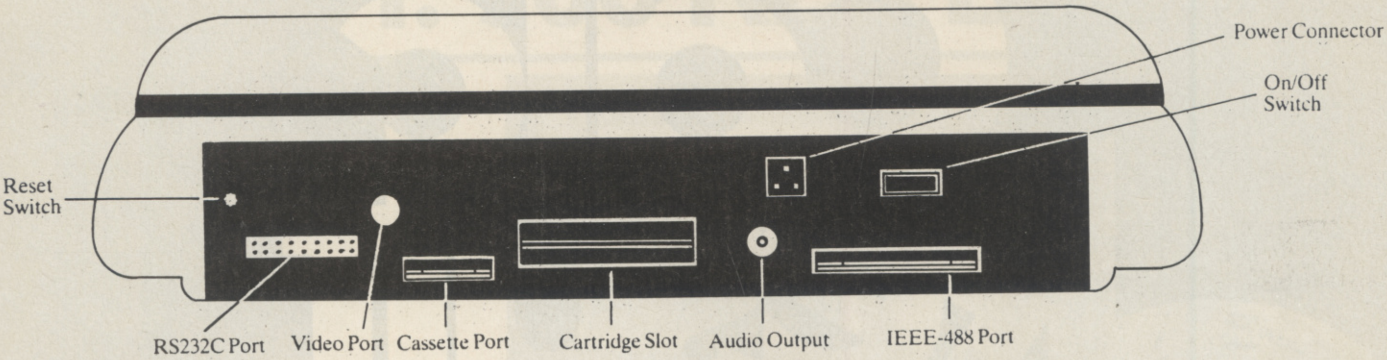
CalcResult 700 ☐ CalcResult 8000 ☐
CalcResult 64 ☐ Easy CalcResult 64 ☐

Name__________

Address__________

__________Tel. No.__________

C.B.M. 700 REVEALED



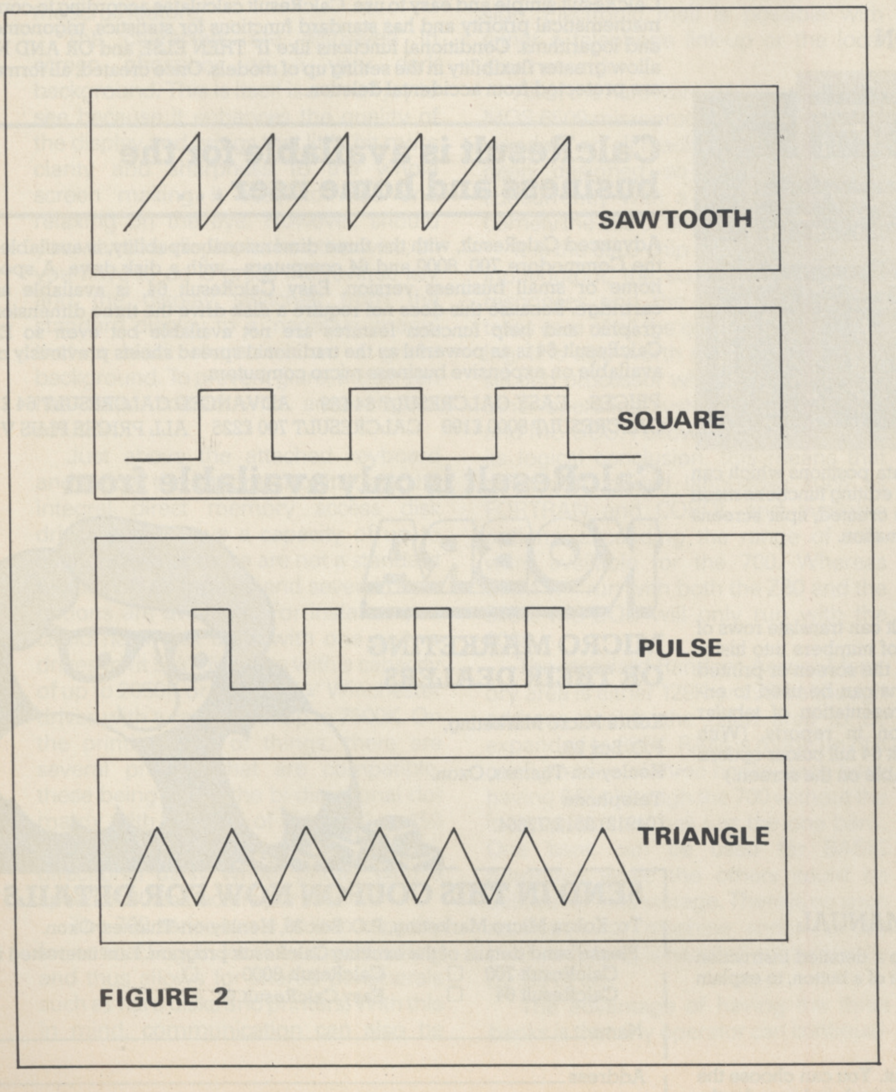


FIGURE 2

chips. Thus, anybody using machine code (for example in compilers) should take care. The zero page locations have not been changed.

The 6509 instructions set for assembly language programming is a slight modification of the 6502 instructions. Two changed commands enable the addressing of the RAM beyond the first bank, these instructions being LDA (label), Y and STA (label), Y.

For the numeric data format, there are a series of choices floating point, mantissa nine digit, exponent two digit, exponent two digit or –39 less than or equal to E less than or equal to 38, which can otherwise be expressed as + or – 1.2*10 to the power of 32.

Moving on to the sound aspect of the machine (the audio output being at the back of the machine between the cartridge slot and the IEEE 488 port) there are three voices each of which have a range of nine octaves. The actual chip for this is the usual SID chip as used in the 64. For a business machine where sound is not one usually one of the outstanding requirements, the performance of the sound chip is adequate although perfectionists would argue that it could be better. Four waveforms are also catered for: sawtooth, square, triangle and pulse which has a variable width.

There is a programmable ADSR generator. The Attack/Delay cycle for each note is a maximum of 32 seconds from start to finish.

Although the Commodore 700 series computer offers outstanding hardware features its true value lies in the tasks it can perform to help your business be more efficient and cost effective. The range of applications for the Commodore 700 series is extensive. They have been developed by people who are not just computer specialists but are experts in the field of their product application and the applications have become more sophisticated with Commodore. Many were first developed for earlier models of Commodore computers and have been significantly expanded and enhanced to take advantage of the additional features of the 700 series.

700 Software Directory

Management of Finance

Microfacts Accounting Suite from **£300** per module MMS Software (0234) 218191
Anagram Accounting Suite from **£299** Anagram Systems (0403) 59551
Pegasus Accounting Suite from **£1500** complete Pegasus Software (0536) 52282
Accounts Data Structure from **£900** L.D. Computer Services (0638) 668681
Inca 2 Management Accounts **£895** Accounting Software (0272) 730950
Micro Computation Account Program **£000** Micro Computation 01-882 5104

Payroll

Basicpay & Superpay **£395** Computastore (061) 832 4761
Payroll 2 **£375** Landsoft 01-878 7044/7

Wordprocessing

Alpha Plus **£50** Avon Computer Rentals (0272) 550600
Superscript II (with Superspell) **£450** Precision Software 01-330 7166
Superspell **£150** Precision Software 01-330 7166

Information Management

PPM Datalogging Program **£000** PPM (04867) 80111
Superclerk from **£395** Superclerk (02572) 78376
Superbase **£450** Precision Software 01-330 7166
Superoffice **£850** Precision Software 01-330 7166

Computers in the Professions

Businessman **£300-£2000** Computer Services Midlands (021) 382 4171
Auditman **£1500** Computer Services Midlands (021) 382 4171
Minuteman **£750** Computer Services Midlands (021) 382 4171
Opti-Computer Program **£250** Devon Computers (0803) 526303
Inca 1 Accounts Preparation **£895** Accounting Software (0272) 730950

CAD/CAM

Digitmaster from **£1400** Jentech Services (07462) 5287

Manufacturing Management

The Last One **£000** DJ A1 (04605) 4117
Factory Manager **£380-£680** Direct Data Marketing 01-834 5016

Utilities

Petspeed **£240** CBM (0753) 79292

Communications

Local Area Network **£000** Dataview (0206) 869414

JCL Software Enhanced BASIC ROM FOR CBM 700 MICROCOMPUTER

The JCL Software EBR for the Commodore 700 machine is a plug-in cartridge containing an 8K ROM, which expands the resident BASIC language by adding thirty nine new key-words, provides a normal environment for machine language programs running in any bank and includes additional RAM mapped in to the system bank to support soft loaded BASIC extensions and machine language programs. The EBR provides users of the established JCL Software BUSINESS ROM, which has featured in the CBM Approved Products catalogue since its introduction, with equivalent or enhanced functions.

More power for the BASIC programmer

The key-words added to the BASIC interpreter are designed to help programmers in four ways. First, they increase program execution speed because the machine language subroutines in the EBR are faster than their BASIC counterparts. Secondly they increase reliability, because the routines in the EBR are already thoroughly debugged; in addition, the programmer can concentrate on writing better code, leaving many awkward functions to the EBR. Third, programs may be finished to a high standard quickly and easily and in a more user friendly style because many of the standard functions normally written in BASIC are already written for you and called by one key-word. Lastly, program size is reduced, because the power of the EBR reduces the number of program statements to achieve the required result. Small size is not a virtue in its own right, (and all the 700 series offers 64K of space for BASIC which is ample) but smaller programs may be written with a better structure, easily debugged and serviced. Six months after completion (?) a well written program is more easily modified than a monstrous birds-nest structured mess!

The new BASIC key-words in the EBR fall into three groups.

1. New facilities, not normally available in the BASIC language, such as versatile screen management and data input functions, memory transfer routines and the evaluation of formulae input from the keyboard in a running program.
2. Greatly improved versions of standard BASIC functions that overcome deficiencies or irritating features of the standard interpreter. These include a single key response, a replacement for INPUT which stops the user clearing the screen and answering with numeric data when letters are required (or vice versa); and a co-ordinate printing system.
3. Simpler ways of doing standard things. For example, try writing a program that sets a window on the screen and draws a frame in it with graphics symbols. Using the EBR this reduces to WINDOW (xl,yl) (x2,y2): FRAME.

In addition to the built in keywords, the EBR also allows you to add soft-loaded BASIC language extensions of your design. By organising code for a specialist function in the manner described in the manual it becomes a simple matter to have your own "BASIC" vocabulary to suit your own needs.

Machine language programming made easier too

Writing machine language for any bank of the 700's memory, other bank 15, presents certain problems due to the 6509 micro-processor's limited instruction set and the lack of interrupt handling and Kernal routines in each bank. Code may be written in the 1K of RAM normally offered in the system bank at $0400 but this is somewhat limiting. Programmers who like to produce hybrid programs – that is, programs containing BASIC and machine language – will find the additional RAM fitted in the EBR invaluable. This RAM may also be used for soft loaded programming utilities such as RENUMBER, FIND, REPLACE etc. All EBR modules include 2K bytes of RAM, and up to 16K may be installed to special order.

For really ambitious machine language projects the EBR includes a system that allows code to run in any RAM bank and access the system bank Kernal entry points as if they were truly available in every bank. There are very few constraints on the design of programs written in this manner so existing software may be upgraded to run on the CBM 700 without too much difficulty. The special keywords FIXMEM and BSYS set up and provide access to this machine language to be smoothly blended together. Using the EBR systems it only took about six hours to convert an Assembler written for the 8032 (over 8K of machine language) to run in bank 1 of the 700; and most of this time was spent looking up the rules for the 700 Kernal.

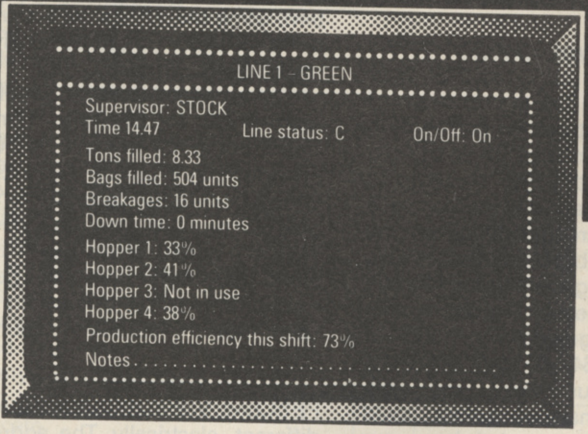
In addition to the published entry points for the CBM Kernal the EBR offers a jump table providing access to many new and valuable routines within the EBR. These may be used in conjunction with the Kernal to create efficient machine code systems in a fraction of the time it would otherwise take.

Concluding . . .

To illustrate the power of the EBR the fifty page manual includes a listing of a program that is only fifteen lines long and offers typing and calculating facilities that would be hard to achieve by other means. This short routine would not represent an unreasonable overhead in any program written for the CBM 700 machine and places two often needed facilities at every users fingertips. The manual also includes worked examples of soft loaded BASIC extensions and merged BASIC and machine language.

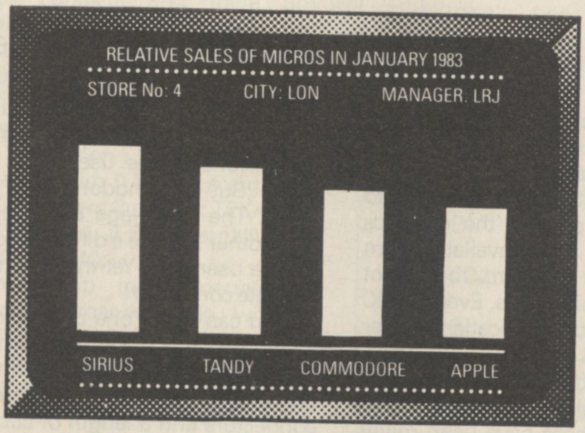
JCL Software can incorporate special security features in the EBR so that it becomes a combined Dongle and utility system for Software Houses wishing to produce programs for the 700 machines. JCL Software can be contacted on 0892-27454.

Hundreds of problems. One solution.



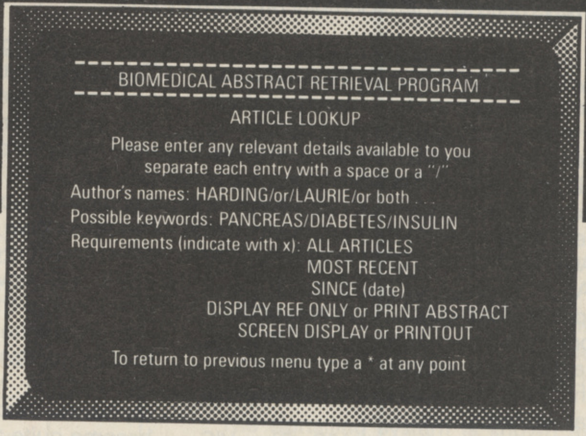
```
LINE 1 – GREEN
Supervisor: STOCK
Time 14.47          Line status: C          On/Off: On
Tons filled: 8.33
Bags filled: 504 units
Breakages: 16 units
Down time: 0 minutes
Hopper 1: 33%
Hopper 2: 41%
Hopper 3: Not in use
Hopper 4: 38%
Production efficiency this shift: 73%
Notes.................
```

Controlling the production of tomato grow bags may sound simple enough, but co-ordinating *all* the different aspects on a brand-new production line was not without its headaches. When the production manager turned to the company's new micro for an answer, it was **THE LAST ONE** which made it possible to create a system in hours rather than months. **TLO** then went on to produce over *one hundred* individual solutions for this company in a period of less than a year.



```
RELATIVE SALES OF MICROS IN JANUARY 1983
STORE No: 4          CITY: LON          MANAGER. LRJ
```

A simple, moving, graphic display was needed by a major computer retailer to demonstrate how a new product line could maintain compatibility with some of his earlier machines. Half an hour's work with **THE LAST ONE** and he had a program displaying bar-charts, graphs and printouts. Little more than an hour later the same program was up and running on three other makes of micro. When asked what made the four machines compatible, he laid the credit squarely with **THE LAST ONE** – "some manufacturers would be hard put to even use the same mains plug – **TLO** at least gets them all speaking the same language."



```
BIOMEDICAL ABSTRACT RETRIEVAL PROGRAM
ARTICLE LOOKUP
Please enter any relevant details available to you
separate each entry with a space or a "/"
Author's names: HARDING/or/LAURIE/or both . . .
Possible keywords: PANCREAS/DIABETES/INSULIN
Requirements (indicate with x): ALL ARTICLES
                                MOST RECENT
                                SINCE (date)
             DISPLAY REF ONLY or PRINT ABSTRACT
             SCREEN DISPLAY or PRINTOUT
To return to previous menu type a * at any point
```

The biochemistry department of a major Scottish university had a need for a filing system which could store details of abstracts of biochemical articles and which would allow retrieval of relevant material through entry of key words alone. A massive database had to be implemented on an Apple II computer and retrieval times needed to be measured in seconds not hours. **TLO** did it and the solution has since been widely published for use on other machines.

Using a computer to solve a complex problem is not always as easy as it sounds.

A product called THE LAST ONE (TLO), however, has helped crack hundreds of computer problems for users throughout the world.

A glance through the three examples on this page will give you some idea just how versatile TLO is.

TLO runs on the Apple II and IIe, Commodore 4032 and 8032/96, TRS-80 Model II (TRSDOS or CP/M), most CP/M, CP/M 86 and MS-DOS machines including the IBM PC (PC-DOS) and Sirius.

Try out TLO for £50 + VAT

A limited version of TLO is now available for just £57.50 including full documentation, VAT, postage and packing. This is fully refundable against purchase of the full version, which costs £185 + VAT for Apple II and IIe, and £330 + VAT for all others.

Find out what TLO can do for you by contacting your local dealer or send for a free information pack. It could be the solution to hundreds of *your* problems.

THE LAST ONE™

D.J. 'Al' Systems Ltd., Dept M. Station Road, Ilminster, Somerset, TA19 9BQ. Telephone: Ilminster (04605) 4117.

Nominated 'SOFTWARE PRODUCT OF THE YEAR 1982', and selected as finalist in Recognition of Information Technology Achievement Awards (RITA)

INTERFACING

Connecting CBM/PET/VIC/64 Through the User Port

Author of the teach-yourself ASSEMBLER TUTORIAL, Owen Murcott describes in the first of a series of DIY articles how to connect two Commodore computers through their user ports. You don't have to understand electronics and you don't always need to write assembler programs to do it.

Not too technical

My interest in the user port started when I bought a second PET. I knew it ought to be possible to connect one machine's user port to the other and to make them talk to each other. But I didn't know how, and the manual was no help. It mentioned an edge connector with pins PA0-PA7, CA1 and CB2. It told me that CA1 is an edge sensitive input; but I didn't understand it! There was nothing about how to write the program to make the machines communicate properly, or what I would be able to do with it when it was written.

Then I acquired a VIC. The VIC Programmer's Reference Guide gives much more information. But its pages of technical details about the 6522 Versatile Interface Adapter and the user port don't help the beginner. How many people understand "negative (high-to-low) transition on the CB2 line"? Well, it means that the voltage has fallen from 5V to 0V. Simply, it has been switched off.

"PET Revealed" and "VIC Revealed" give similarly detailed technical descriptions of chip registers. Reading them is hard going. I realised that the information is all there but indigestible. However, if you dig deeply enough into "PET Revealed" and persevere you will find a few ideas for things you can do. This series was born from some discoveries – not original inventions – during patient decoding (and sometimes correction) of what the technical authors had written, and from the results of experiment. I hope it will help you to get started.

From the beginning

Inevitably there will be technical terms. I shall explain them; the explanations will start at the beginning, assuming no prior knowledge. So do not be put off by technicalities.

You will be able to have some fun just by using the sample programs from this series. Most of them will be in BASIC. There will be a version of each for the PET/CBM, the VIC and the Commodore 64. If you do not understand the assembler code included in some routines, it does not matter. Just copy them and use them. They will be written so that they will load from a BASIC program. If you do understand assembler, and have the necessary software, then you will be able to change them to suit your own purposes and of course go much further.

Things you can do

This is where the books stop! So here are some ideas. There are a lot of possibilities for interactive games with two machines connected. The old game BATTLESHIPS is the first to spring to mind. With two machines you can each have your own screen, hidden from the other. A variant of battleships could have one of you driving a destroyer chasing (or avoiding) the other in a submarine. Using the sound generator in the VIC or the Commodore 64, you could search by listening to your sonar and hydrophones. Two-machine games could become quite a vogue – let's hear your ideas.

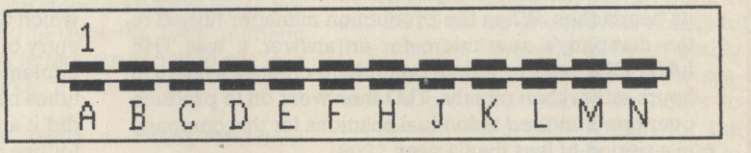


Fig 1 - USER PORT view from the rear

Have you got an old button-keyboard PET? By connecting a VIC you can add a full-size keyboard and function keys; it is a cheap solution. If you connect a VIC to the 8032 it will provide the graphics characters which are unavailable from the 8032 business keyboard. You do not need to use machine code. Even BASIC will handle the communications faster than you can type.

Inter-connected machines can use each others' peripherals: screens, disks, printers, tapes. There have been many times when I wanted to have two different screen outputs simultaneously, or to share the disk drive between two machines. One machine can transfer data or programs from the disk to the other. You could connect a printer to the second machine and use that machine's memory as a huge printer buffer. Outputs could then be spooled whilst other processing continues on the first machine.

You can dump 24k from one machine's memory to the other in just over three seconds with the right machine code routine. This gives the possibility of using the other machine as a backup in a process control system by dumping frequently from one to the other.

The 6502A microprocessor in the VIC is reputedly faster than the PET's. Make your own distributed processing system, using the VIC as the calculator for complex tasks, otherwise to give extra memory when needed.

Colour high-resolution graphics can use a lot of memory. Connect a Commodore 64 to the PET/CBM to provide the graphics output; it has enough memory capacity for all the graphic routines you will need. The PET/CBM is then released to do the other work. Not only will you get high-resolution graphics output but also the Commodore 64 sprites and sound.

How is it done

PET/CBM, VIC and Commodore 64 are different, electrically. The addresses of the registers in their chips are also different. What else would you expect? However, the physical arrangement and dimensions of the user ports are the same. But Commodore have done it again. The space-age 8000 series and big brother 700 use a different connector for the user port. Yet they still have the cassette connector!

You can make one connector which will suit all other Commodore machines. The physical link between the two user ports is simply made with two edge connectors and a length of cable. It will not matter which end is plugged into which machine, as long as you don't plug it in upside down. The machines will then talk to each other along the cable.

The new 8000 and 700 machines have an IEEE connector for the user port, like the one at the back of the disk drive. You cannot just use a standard IEEE-to-IEEE connector to connect them together. If you did so, you would connect together user port contacts which should not be connected. You will have to make your own. In the worst situation, you would then need three different connectors to cover all combinations of machine. The edge connector described in this article is suitable for all but the new 8000 and 700, but their connections do follow the same principles.

The electrical differences have to be accommodated within the program. This is why you need different programs for the different machines. Each must transmit exactly the same kind of signals from its user port to the other. The signals have to be those which any of the other machines will recognise – the lowest common denominator. Unfortunately this stops you from using the whole range of user port features provided in each machine. Some of the programs will have just a few extra instructions which otherwise would not be needed. The benefit is that you can connect any two machines if you have the right connector, and they will communicate.

Making the connection

Look at the edge of the circuit board in the user port. You will see that it is double-sided. The contacts on its underside are not connected to the ones on the upper surface. It is important to realise this because some electronic equipment (such as a HI-FI) can have duplicated contacts and there are connectors for it on the market. The contacts on the under-side are the ones we shall use.

Materials required to make the connector are:

Two 12-position 24-contact edge connectors with 0.156" spacing. The one I used bears the code: TEKA TP3 121 E04. The IEEE alternative is CINCH 57-30240;

A length (up to 3 metres) of multi-core screened cable, with at least 11 core wires. Solder the wires to the edge connector tabs. If it has more than 11 cores, you can cut the others short inside the sheath. Don't foul the wrong contacts or connect top to bottom;

Some kind of cap to protect the edge connector tabs. A length of plastic spine as used to grip A4 files will do nicely. Cut it to the length of the connector. After you have soldered the connections, fix it with epoxy resin.

Fig 1 shows the user port contacts identified by letters A-N, excluding G and I. The contacts are called "pins". They also have names which correspond to registers in the chip which controls the user port. Each machine has different names for the pins and uses different registers! Table 1 and fig 2 show you how the two connectors should be wired together!

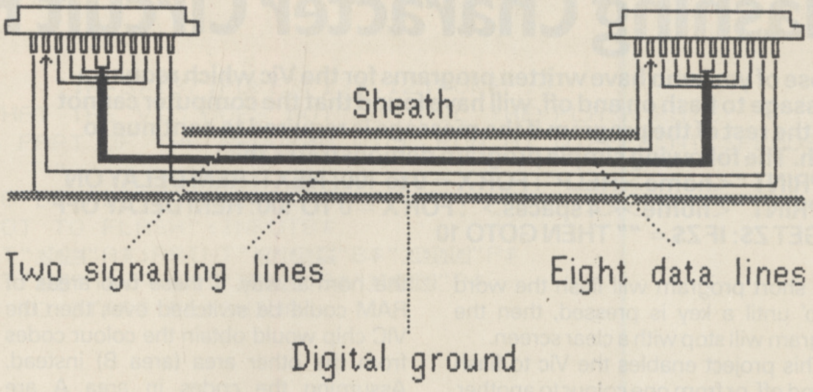


Fig 2 – Connector wiring

PIN	Name			Connect to
	PET	VIC	64	
A	Gnd	Gnd	Gnd	A
B	CA1	CB1	FLAG2	M
C	PA0	PB0	PB0	C
D	PA1	PB1	PB1	D
E	PA2	PB2	PB2	E
F	PA3	PB3	PB3	F
H	PA4	PB4	PB4	H
J	PA5	PB5	PB5	J
K	PA6	PB6	PB6	K
L	PA7	PB7	PB7	L
M	CB2	CB2	PA2	B
N	Gnd	Gnd	Gnd	N

TABLE 1

Solder the sheath to pin A (and also to pin 1 in the same position on the top side, if you wish) to make the protective ground connection. It will serve to anchor the cable and to stop the wires from being pulled loose by accident. The cable should then come out from the "A" pin end of each connector. When you plug the connector into the user port, the cable will always lie at the cassette port side of it and you can easily remember which is the correct way round.

Crossing over

You will see that pins C-L are wired to the corresponding pins on the other connector. They carry the data to and fro between the machines, a byte at a time. Pins N are connected to each other to provide the digital ground. Connections between pins B and M cross over. This enables you to signal from one machine to the other in order to control the flow of data.

The signalling system is known as "handshaking". Handshake signals sent from pin M are received on pin B. They are produced by poking a 1 or a 0 to the register for pin M in the user port chip. The 1-0 signal is detected at the other end by peeking at the register for pin B. These signals are used by one machine to advise the other that:

Either it is now ready to receive a data byte which the other is waiting to transmit; or

It has just transmitted a data byte.

The data bytes are poked to another user port chip register, connected to pins C-L, and peeked from it. And so bytes can be transmitted one at a time from machine to machine. Handshaking ensures that the two machines do not get out of step.

Warning

The interface chip is not buffered. Do not connect or dis-connect anything to the user port unless the machine is switched off. You could blow the chip.

Next month: Controlling data direction. How handshaking works. Registers to use. Using them to connect an external keyboard.

Future articles will cover how to: transfer programs and memory locations, print on the other screen, access each other's variables, arrange master-and-slave and equal-partner communication.

Finally, just in case you wondered, I drew the diagrams on a five-year-old PET2001 with an MTU high-resolution graphics board. They were printed on a Centronics 739 dot matrix printer. But high-resolution graphics are another story.

Flashing Character Circuit For The VIC 20

Those of you who have written programs for the Vic which require a message to flash on and off, will have found that the computer cannot run the rest of the program if the message is required to continue to flash. The following simple program demonstrates this:

```
10 PRINT "<home> HELP": FOR X = 0 to 100: NEXT: REM DELAY ON
20 PRINT "<home><4 spaces>": FOR X = 0 TO 100: REM DELAY OFF
30 GET Z$: IF Z$ = "" THEN GOTO 10
```

This short program will flash the word 'Help' until a key is pressed, then the program will stop with a clear screen.

This project enables the Vic to flash on and off, or from one colour to another, any combination of characters anywhere on the screen and also allows the computer to continue the program at normal speed.

I must draw your attention at this point to the fact that the project requires the cutting of a piece of circuit track and therefore will invalidate any guarantee.

When the Video Interfacing Chip (VIC) is instructed to print a character on the screen it communicates with three areas of memory:-

A – The character generator ROM, to find out dot pattern to display.

B – The screen RAM, to find out which character and whereabouts on the screen to print it.

C – The colour RAM, to find out which colour the character is and whether or not it is in multicolour mode.

We are concerned with the last area of RAM (c).

Those of you who have a copy of Vic Revealed will know that the colour RAM is only four bits wide. Bits 0 to 2 determine the colour of the character, and bit 3 selects multicolour mode. The RAM chip used for this area is the same chip used for the rest of RAM, i.e. 2114 which is a 1024 by 4 bytes of RAM. The Vic screen is 22 x 23, which is 506 locations, therefore only 506 locations are required. Just under half of the colour RAM Chip is used. This seemed a waste of RAM.

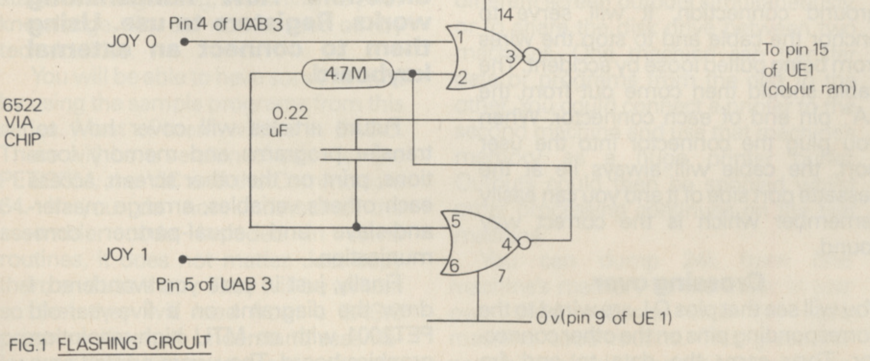


FIG.1 FLASHING CIRCUIT

If this RAM was divided into two sections, e.g. areas A and B (512) each, The colour code in A could be used in the normal way. If these two areas of RAM could be switched over, then the VIC chip would obtain the colour codes from the other area (area B) instead. Assuming the codes in area A are different from those in area B, then the screen displays a different set of colours. Now oscillate the two areas at approximately one cycle per second; the entire screen will change from one colour combination to another every second.

A circuit was required which could allow the two halves of the colour RAM chip to be switched over and back again at a steady rate. The circuit also had to be able to be locked in either state in order for the program to alter parts of the RAM. Finally the circuit had to select the same area on power-up or re-set and not oscillate. This seemed at first a tall order, but two more NOR gates did the trick.

Figure 1 shows a free running oscillator giving a square wave output at approximately one cycle per second, when the two inputs are at logic one (5 volts). When either of the inputs are at logic zero, (0 volts) the output stops pscillating and remains at a logic one or zero, depending which of the inputs is at logic zero. The output is taken to the most significant address bit of the colour RAM chip, pin 15. To do this pin 15 must be disconnected from the Vic circuit by cutting the track, as shown in figure 3. Now the output wire of the oscillator can be soldered to pin 15 of the colour RAM chip. BE CAREFUL NOT TO OVERHEAT THE I.C.

The oscillator is constructed on a piece of vero board and stuck upside down to the VIC board with the same double sided adhesive tape. The two control wires are soldered to the 6522 VIA chip (UAB3) which has the joystick inputs 0 and 1 (pins 4 and 5). If other inputs are required then the commands for this circuit will be different. The two power lines should be connected to the 0 volt and the 5 volt supply lines.

Testing

Power up. If you do not obtain the normal VIC screen then power off IMMEDIATELY and check all connections for short circuits. Having obtained the normal screen POKE 37139,12 to select the two joystick lines to outputs, (this will also cause the display to begin flashing). Now a POKE 37137,4 will select area A of the colour RAM, POKE 37137,8 will select area B. POKE 37137,0 will start the circuit oscillating. POKE 37137,12 will stop the display oscillating.

FIG 2

COMMANDS

```
POKE 37139, 12(VIA O/P JOY 0 & JOY 1)
POKE 37137,  0 Starts flash circuit
POKE 37137, 12 Stops flash circuit
POKE 37137,  4 RAM Area A
POKE 37137,  8 RAM Area B
```

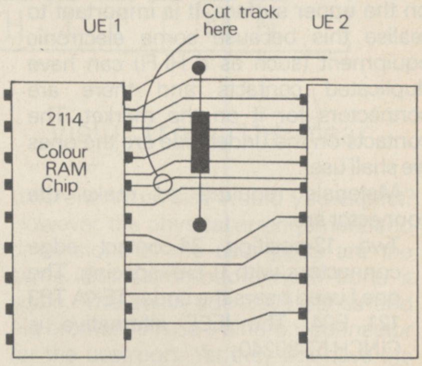


FIG 3 SHOWING MODS TO VIC BOARD

To obtain a single flashing character each half of the colour RAM requires different colour codes. For non flashing characters the codes in each half of the colour RAM must be identical. Once this is done the oscillator can be set to run and the two areas of colour RAM will alternate onto the screen and only the codes which are different will cause the characters to flash.

Figure 2 gives a list of commands and figure 4 shows a short demonstration program, the last part of which forces the oscillator to oscillate much faster, giving a fascinating display.

We feel that readers must remember that ANY WARRANTY OR GUARANTEE WILL BE MADE INVALID IF THIS PROJECT IS ATTEMPTED. Also ONLY those readers with EXPERIENCE in soldering small circuits should attempt this project.

FIG 4

```
READY.
 2 REM  FLASHING DEMO
 3 :
 4 :
 5 PRINT"□"
 10 P$="                         ":F=37137:POKE37139,12:POKEF,4
 20 M$="THIS IS TO SHOW THAT THE VIC DOES'NOT CONTROL THE FLASH RATE"
 30 M$=M$+" AND THAT THIS PART OF THE PROGRAM WILL RUN AT DIFFERENT SPEADS."
 35 M$=M$+"     NOW FASTER    "
 40 PRINT"□":PRINT"WORD TO BE FLASHED":INPUTA$
 50 PRINT"□":PRINT"WORD NOT TO FLASH":INPUTB$
 60 POKEF,4:PRINT"□":PRINT"QQE"A$:PRINT"QQQQ≤"B$"QQQQ"P$
 70 POKEF,8:PRINT"□":PRINT"QQ"A$:PRINT"QQQQ"B$"QQQQ"P$
 80 PRINT"SQQQQQQQQQQQQQQF TO START FLASHING"
 85 GETZ$:IFZ$=""THEN85
 90 PRINT"S";P$:POKEF,0
 100 D=300
 110 FORN=1TOLEN(M$)
 120 FORX=0TOD:NEXTX
 130 PRINT"SQQQQQQQQQQQQQQQQ"P$
 140 P$=P$+MID$(M$,N,1):P$=RIGHT$(P$,21)
 150 NEXTN
 160 D=D-150:IFD<0THEN200
 170 GOTO110
 200 PRINT"□";:FORX=0TO504:PRINT"■ ";:NEXTX
 205 POKEF,8:FORX=0TO505:POKE38400+X,INT(RND(1)*7):NEXT
 210 POKEF,4:FORX=0TO505:POKE38400+X,INT(RND(1)*7):NEXT
 220 FORX=0TO999:POKEF,8:POKEF,4:NEXT
 230 POKEF,4:PRINT"□QQQQQQQQQQQQ■■END OF DEMO."
 240 GOTO240
READY.
```

C.C.I SOFTWARE

SUBSCRIPTION

Are you tired of keying in all the programmes in this magazine?

Keying in lengthy programmes can be extremely tedious, and you can also end up spending a lot of time weeding out syntax errors. We know the programmes are popular from the volume of enquiries we get. So we have decided to make available to you all our programmes on tape.

For **£15** per year we will send you **1** cassette every **¼** containing all the programmes listed in the previous **3** issues relating to your type of machine.

If you are already a subscriber to C.C.I. magazine we are making the offer at a reduced rate of **£10** P.A. If you are not already a subscriber, you can still take advantage of this offer by starting a subscription to the magazine at the same time. (See page 96 for details.)

The first tape, containing programmes from the **June, July** and **August** issues is available now, so fill in the coupon and send your cheque/postal order etc to us and we will despatch your cassette within **28** days.

Please send me four quarterly cassettes of the program listings in Commodore Computing suitable for my ☐ VIC20, ☐ 64, ☐ PET.

I enclose a cheque for
☐ £15 UK
☐ £20 Europe
☐ £28.50 Outside Europe
Please debit my
VISA/AMEX/ACCESS card
number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name ....
Address ....
....
Telephone (home) ....
Telephone (business) ....
Signed ....
Date ....

Return form to Subscriptions Manager, Commodore Computing International, 167 - 169 Great Portland Street, London W1.

GIVE YOUR VIC20 & 64 IEEE PLUS RS232

VIC and 64 users

Would you like to be able to access **any** of these peripherals from your computer?

- ⅓ megabyte disks (Commodore 4040 drive)
- 1 megabyte disks (Commodore 8050 drive)
- 10 megabyte disks (Commodore 9090 hard disk)
- Printers including a wide range of inexpensive IEEE and RS232 matrix and quality printers
- IEEE instruments such as volt meters, plotters etc.

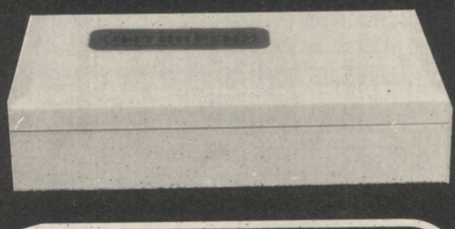
Now you are no longer limited by the VIC or the 64's serial bus. Simply by attaching INTERPOD you can vastly increase the power of your VIC 20 and when used with the new 64, INTERPOD turns the computer into a really powerful system.

With INTERPOD the VIC and 64 become capable of running really professional quality software such as Word-processing, Accounting, Instrument control and many more.

INTERPOD will work with any software. No extra commands are required and INTERPOD does not affect your computer in any way.

Using INTERPOD is as easy as this:

Simply plug INTERPOD into the serial port of your computer, power-up and you are ready to communicate with any number of parallel and serial IEEE devices and any RS232 printer.



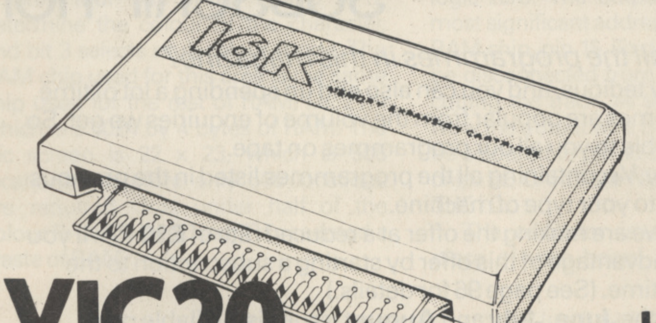
INTERPOD

£125

Oxford Computer Systems (Software) Ltd.
Hensington Road, Woodstock, Oxford OX7 1JR, England Tel. (0993) 812700

STARTECH

Absolutly the lowest prices!



£28.95

Including VAT and Postage and Packing.

VIC20 16K RAM PACK

Tick for further information

☐ VIC 20 PRODUCTS
☐ COMMODORE 64

All prices subject to availability or change without notice

PLEASE SEND ME

VIC 20 16K RAM PACK

Qty	Price	TOTAL
	£28.95	

Name
Address

I enclose Cheque, P/O for
CREDIT CARD ☐ ACCESS ☐ BARCLAY CARD ☐

STARTECH 208 Aigburth Rd, Aigburth, Liverpool L17. 051 727-7267

BASIC PROGRAMMING

Inside Basic
I: The Anatomy Of A Basic Program

1: The Anatomy Of A Basic Program

A program line entered on the keyboard is first written into the keyboard buffer. The operating system then transfers it byte by byte onto the screen. The line however is not entered into memory until a carriage return is pressed. This causes the operating system to transfer the program line just entered from the screen into memory via the Basic buffer where the line of code is compressed and formatted. Each line is stored in a specific format using a compressed version of the Basic text. This reduces the memory requirements of a program and allows longer programs to be run. The compression of Basic text involves conversion of the Basic commands into single byte tokens. The command PRINT, instead of being stored as five ASCII characters, is stored in a single byte as the decimal value 153. When a program is listed the text compression process is reversed. As far as the user is concerned the program is stored in the same form as it was written.

A useful bonus of text compression is a shorthand way of writing Basic commands, either in a program or direct command mode. This stems from the fact that the routine which converts commands to tokens looks only at the first two or three characters of a command word. Other characters in the command word are there for the user's convenience only. Normally if we entered only the first couple of characters of a command the computer would respond with a syntax error message. This can be avoided though by using a simple method of fooling the error detection routines. The method is this. To enter any Basic reserved word type the first letter of the word then depress the shift key and type the second letter. By using just the first two letters, there could be confusion between commands which share the first two letters. For example STOP and STEP, in these cases the first two letters should be typed followed by the third with the shift key depressed. The following table is a list of Basic commands with their corresponding token values in decimal.

64	VIC	PET	
2048	4096	1024	contents 0
2049	4097	1025	link address low points to starting location of next line
2050	4098	1026	link address high
2051	4099	1027	line number low
2052	4100	1028	line number high
2053	4101	1029	start of compressed Basic text. Number of bytes occupied variable. End of line flagged by a zero byte.

BASIC Keyword Codes

Code (decimal)	Character/ Keyword	Code (decimal)	Character/ Keyword	Code (decimal	Character/ Keyword	Code (decimal)	Character/ Keyword
0	End of line	66	B	133	INPUT	169	STEP
1-31	Unused	67	c	134	DIM	170	+
32	space	68	D	135	READ	171	—
33	!	69	E	136	LET	172	.
34	..	70	F	137	GOTO	173	/
35	≠	71	G	138	RUN	174	↑
36	$	72	H	139	IF	175	AND
37	%	73	I	140	RESTORE	176	OR
38	&	74	J	141	GOSUB	177	>
39	’	75	K	142	RETURN	178	=
40	(	76	L	143	REM	179	<
41	)	77	M	144	STOP	180	SGN
42	·	78	N	145	ON	181	INT
43	+	79	O	146	WAIT	182	ABS
44	.	80	P	147	LOAD	183	USR
45	—	81	Q	148	SAVE	184	FRE
46	.	82	R	149	VERIFY	185	POS
47	/	83	S	150	DEF	186	SQR
48	0	84	T	151	POKE	187	RND
49	1	85	U	152	PRINT ≠	188	LOG
50	2	86	V	153	PRINT	!fl(	EXP
51	3	87	W	154	CONT	190	COS
52	4	88	X	155	LIST	191	SIN
53	5	89	Y	156	CLR	192	TAN
54	6	90	Z	157	CMD	193	ATN
55	7	91	[	158	SYS	194	PEEK
56	8	92	X	159	OPEN	195	LEN
57	9	93	]	160	CLOSE	196	STR$
58	:	94	↑	161	GET	197	VAL
59	;	95	←	162	NEW	198	ASC
60	<	96-127	Unused	163	TAB(	199	CHR$
61	=	128	END	164	TO	200	LEFT$
62	>	129	FOR	165	FN	201	RIGHTS$
63	?	130	NEXT	166	SPC(	202	MID$
64		131	DATA	167	THEN	203-254	Unused
65	A	132	INPUT	168	NOT	255	π

Note that the left parenthesis is stored as part of the one-byte token for functions TAB and SPC, however, the other functions use a separate byte for this symbol. For example, the line:

```
10 IF INT(A) <5 THEN PRINT TAB(X)
```

would be coded as the following bytes (in decimal):

Link	10	0	139	32	181	40	65	41	179	53	32	167	32	153	32	163	88	41	0
	Line Number		↓ IF		↓ INT	(	A	)	<	5		↓ THEN		↓ PRINT		↓ TAB(	X	)	

The token value given to a Basic command is a pointer into a table of reserved command words located at the beginning of the Basic interpreter. By subtracting 127 from the token value, the number of the word in that table can be obtained. It should be noted that the technique of using tokens to represent words can give the programmer a very powerful method of generating print statements without consuming a large amount of memory. This can prove especially useful in games programs, such as Adventure, which require a lot of text generation. A table of, say, 200 common words is constructed and each time one of these words appears in a print statement it is represented by a number pointing to its location in the table. Obviously some sort of output subroutine is required to convert the token back into a word but the saving in memory space can be considerable, especially if done using machine code routines.

Having converted the Basic command into a single byte token, the line is stored together with the line number and a link address at a location just above that of the last line entered. Assuming it is the first line of a program being entered, then it will be entered into memory using the following locations and format:

A Basic program is stored as a series of blocks each of variable length and representing one line in the program. Each block having a fixed format and all blocks being connected via a linked list structure. Each line in a program is stored in memory in the correct position dictated by the magnitude of its line number, thus it will be the line with the lowest number which is stored at the bottom of memory. The line number is stored in bytes 3 and 4 of a block in binary format, this means that the largest line number that can be used in a program is 65535. In practice the largest line number useable is 63999, any line number above that will give a syntax error on entering. When a program is run, the current line number being executed is stored in locations 54 and 55 – PET, 57 and 58 – VIC and 64. A direct mode of operation for the processor is indicated when the contents of these two bytes is zero. The double byte link address points to the starting byte of the next line. As each line is executed this address is stored in locations 119 and 120 – PET, 122 and 123 – VIC, and 64 where it is accessed when the operating system fetches the next line. The link address of the last line of a program points not to another link address as in a normal program line, but to two bytes the contents of which are zero. The storage of a program within memory is best illustrated by the following diagram.

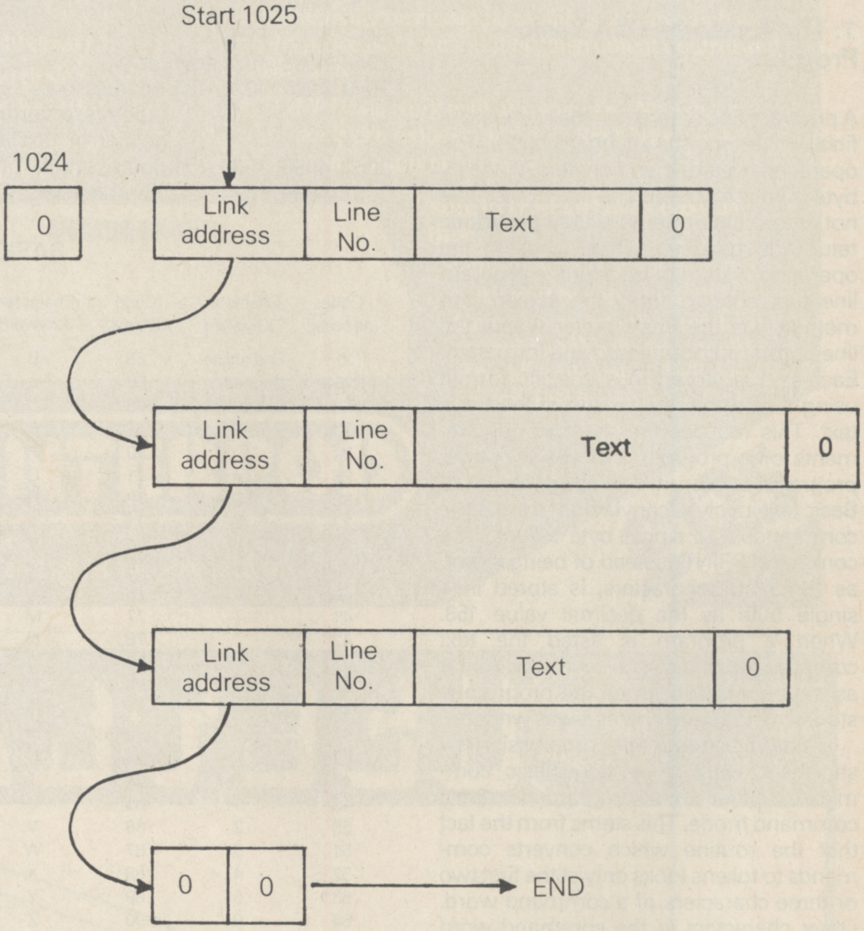


Figure 2. — How a Basic program is stored in memory.

A knowledge of how a program is stored in memory is useful, enabling several operations not otherwise allowed by the system to be performed; line renumbering, program merging, and overlays. Line numbers can be changed simply by changing the contents of bytes three and four of each block (line). The beginning of each line is located using the link address obtained from the previous line. It should be noted however that this will not renumber any of the jump addresses stored in the Basic text. To do this the program must examine the tokens used in the Basic text area, looking for GOTO, GOSUB, or THEN commands and renumber their jump addresses. Whereas the line number is stored in a binary format the jump line number is stored in ASCII and is thus of variable length.

BASIC PROGRAMMING

Below is a listing of a program that renumbers the lines in a program. The program will renumber any lines up to line number 62999 from 10 in steps of 10. This is not meant as an actual renumbering program as there is no facility for changing line numbers in GOTO statements but it is a good example of how to manipulate and use the link addresses and the way that the line number is stored.
Enter it onto the end of a program and type 'RUN63000', the new line number followed by the old line number will be displayed for each line. List the program after running and you will see that the program is numbered from 10 in steps of 10. The array no is a quick reference to what the old line number was, i.e. if you want the old line number of say 120, PRINT no(12).

```
63000 CLR:BASE=1024:PNTR=BASE
63010 DIMNO(200):LINE=10
63020 NL=PEEK(PNTR+1)+256*PEEK(PNTR+2)
63030 OL=PEEK(PNTR+3)+256*PEEK(PNTR+4)
63040 IF OL>62999 OR NL=0 THEN 63100
63050 POKEPNTR+3,(LINEAND255):POKEPNTR+4,(LINE/256)
63060 PNTR=NL-1:PRINTLINE,OL
63070 NO(LINE/10)=OL
63080 LINE=LINE+10
63090 GOTO 63020
63100 END
READY.
```

Double Density Plotting On The 64

In the 64's character set are a group of quarter square characters. These characters may be fully implemented by using them for plotting in higher resolution than is initially available. With this routine, you can plot with a resolution of 80 horizontal by 50 vertical points. If there is any character in the position to be plotted, it will be looked at and if the ¼ square can be added to it to give another of the 64's characters, it will be plotted. Otherwise the point will not be plotted.

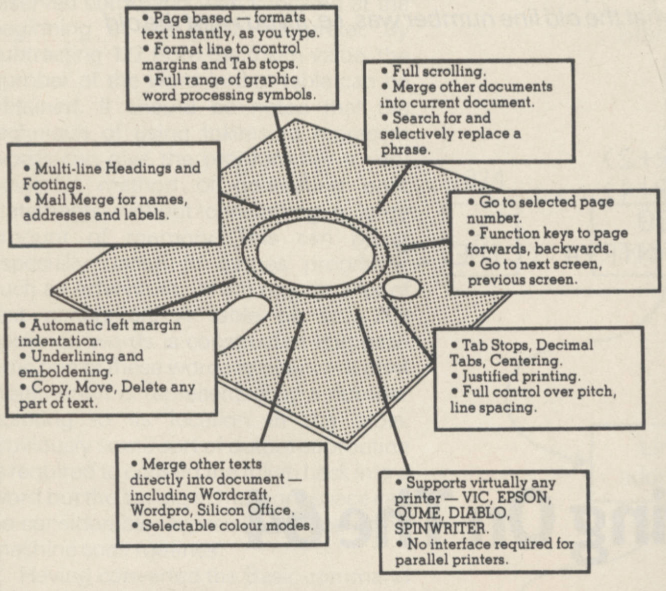
The first program is a Basic loader for the Double Density plot routine. This program must be run before running any programs for plotting in double density. The second program uses the first to plot lines on the screen. The line calculations are in basic. The final listing is a loader for the equivalent machine code routine for plotting lines, this routine also uses the point plot routine.

```
1000 REM
1010 REM
1020 REM ********************************
1030 REM *SUBROUTINE TO PLOT POINTS IN *
1040 REM *DOUBLE DENSITY FORMAT ON THE *
1050 REM *64.          GIVEN           *
1060 REM *X-COORD IN LOCATION 681      *
1070 REM *Y-COORD IN LOCATION 682      *
1080 REM *0 IN LOCATION 683 TO ADD     *
1090 REM *1 IN LOCATION 683 TO DELETE  *
1100 REM *ERROR FLAG IN LOCATION 679   *
1110 REM *1 OR 2 = PLOT OUT OF RANGE   *
1120 REM *4 = NON-PLOTTABLE CHARACTER  *
1130 REM *    ALREADY AT THESE         *
1140 REM *    COORDINATES ON THE SCREEN*
1150 REM *COLOUR IN LOCATION 786.      *
1160 REM *ROUTINE CALLED BY SYS(30368) *
1170 REM ********************************
1180 I=30368:T=0
1190 READ A
1200 IF A=-1 THEN 1240
1210 POKE I,A:T=T+A
1220 I=I+1
1230 GOTO 1190
1240 PRINT"□ROUTINE 1:"
1250 IFT=24016THENPRINT"▒▒ENTERED O.K.":GOTO2000
1260 PRINT"▒▒ENTERED INCORRECTLY"
1270 END
1280 DATA72,152,72,138,72,169,0
1290 DATA141,167,2,141,168,2,133
1300 DATA99,173,170,2,133,98,165
1310 DATA98,201,80,144,3,238,167
1320 DATA2,173,169,2,201,128,144
1330 DATA3,238,167,2,44,167,2
1340 DATA240,3,76,93,119,169,49
1350 DATA56,229,98,133,98,78,169
1360 DATA2,46,168,2,70,98,46
1370 DATA168,2,6,98,6,98,6
1380 DATA98,165,98,6,98,38,99
1390 DATA6,98,38,99,24,101,98
1400 DATA133,98,234,234,234,234,165
1410 DATA99,105,4,133,99,174,168
1420 DATA2,169,1,141,168,2,224
1430 DATA0,240,6,14,168,2,202
1440 DATA144,246,172,169,2,177,98
1450 DATA162,0,221,99,119,240,13
1460 DATA232,224,16,144,246,169,4
1470 DATA141,167,2,76,93,119,173
1480 DATA171,2,208,8,138,13,168
1490 DATA2,24,170,144,13,173,168
1500 DATA2,73,255,141,168,2,138
1510 DATA45,168,2,170,189,99,119
1520 DATA172,169,2,145,98,24,165
1530 DATA99,105,212,133,97,165;98
1540 DATA133,96,173,18,3,145,96
1550 DATA104,170,104,168,104,96,32
1560 DATA126,123,97,124,226,255,236
1570 DATA108,127,98,252,225,251,254
1580 DATA160,0,-1
READY.
```

GET MORE FROM YOUR 64. WITH VIZAWRITE 64.

ONLY **£69** plus VAT

VIZAWRITE 64 — SPECIFICATIONS



- Page based — formats text instantly, as you type.
- Format line to control margins and Tab stops.
- Full range of graphic word processing symbols.

- Full scrolling.
- Merge other documents into current document.
- Search for and selectively replace a phrase.

- Multi-line Headings and Footings.
- Mail Merge for names, addresses and labels.

- Go to selected page number.
- Function keys to page forwards, backwards.
- Go to next screen, previous screen.

- Automatic left margin indentation.
- Underlining and emboldening.
- Copy, Move, Delete any part of text.

- Tab Stops, Decimal Tabs, Centering.
- Justified printing.
- Full control over pitch, line spacing.

- Merge other texts directly into document — including Wordcraft, Wordpro, Silicon Office.
- Selectable colour modes.

- Supports virtually any printer — VIC, EPSON, QUME, DIABLO, SPINWRITER.
- No interface required for parallel printers.

THE PERSONAL WORD PROCESSOR

Vizawrite 64 is a high performance, low-cost word processor designed especially for the Commodore 64 computer. Vizawrite 64 takes full advantage of the colour, graphics and memory capabilities of the computer to bring you the power and style of a dedicated word processor.

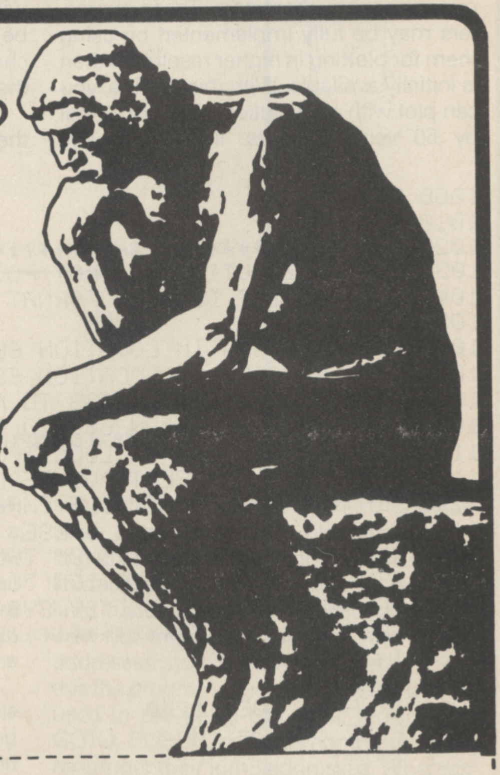
Serious word processor users expect their word processor to format their text as they type, Vizawrite 64 does this instantly. Tabs, indentation, centering are all clearly visible and easily altered, so you know exactly the format of your text all the time.

Vizawrite 64 is a disk-based word processing program — it is available NOW from your local Commodore dealer or direct from Viza Software. It costs just £69.00 plus VAT (£79.35).

VIZA SOFTWARE,
9 MANSION ROW, BROMPTON,
GILLINGHAM, KENT ME7 5SE.
TEL: MEDWAY (0634) 813780.

VIZA SOFTWARE

Thinking about disk storage?



Rodin certainly wasn't, but then

he didn't have disks all over the place....

We've thought about your storage problems,
come up with the answer -
and now thousands of people use our unique
suspension filing system for their floppies....

Use the MC^2 `SAFER´ ~

file and find the right information quickly and easily,
make really effective and efficient use
of your micro-computer.
Lockable and strong ~ it really is SAFER!

CUT OUT THE COUPON NOW ⟶

Name ____________________
Company ____________________
Address ____________________
____

☐ **send information** **Tel No** ____________
☐ **send a SAFER at £39.50 (plus VAT)**

MC2 Ltd 262 The Broadway London SW19 1SB
Tel 01-540 9370

CCI.9.83.

BASIC PROGRAMMING

```
10 REM *******************************
20 REM *PROGRAM TO DRAW LINES ON     *
25 REM *SCREEN                       *
30 REM *USING DOUBLE DENSITY MACHINE *
40 REM *CODE PLOT SUBROUTINE -:      *
45 REM *SYS(303368)                  *
50 REM *******************************
60 REM
70 REM
75 POKE55,0:POKE56,112:POKE51,0:POKE52,112:CLR
76 POKE53280,12:POKE53281,12
80 PRINT"□";
90 PRINT"▣";
100 INPUT"◪";X1,Y1,X2,Y2,COL
110 GOSUB140
120 PRINT"▣              "
130 GOTO090
140 REM
150 REM **CHECK COORDINATES IN BOUND**
160 REM
170 IF(X1>=0ANDX1<=79)AND(X2>=0ANDX2<=79)THEN200
180 ER$="▦X OUT OF RANGE"
190 RETURN
200 IF(Y1>=0ANDY1<=49)AND(Y2>=0ANDY2<=49)THEN230
210 ER$="▩Y OUT OF RANGE"
220 RETURN
230 ER$=""
240 XD=X2-X1
250 YD=Y2-Y1
260 REM  **NEAREST DIAGONAL**
270 A0=1:A1=1
280 IFYD<0THENA0=-1
290 IFXD<0THENA1=-1
300 REM  **NEAREST HORIZ/VERT**
310 XE=ABS(XD):YE=ABS(YD):D1=XE-YE
320 IFD1>=0THEN360
330 S0=-1:S1=0:LG=YE:SH=XE
340 IFYD>=0THENS0=1
350 GOTO380
360 S0=0:S1=-1:LG=XE:SH=YE
370 IFXD>=0THENS1=1
380 REM  **SET UP**
390 TT=LG:TS=SH:UD=LG-SH:CT=SH-LG/2
400 D=0
410 REM  **WHILE MORE POINTS DO**
420 POKE681,X1:POKE682,Y1:POKE683,D:POKE786,COL:SYS(30368)
430 IFCT>=0THEN460
440 CT=CT+TS:X1=X1+S1:Y1=Y1+S0
450 GOTO470
460 CT=CT-UD:X1=X1+A1:Y1=Y1+A0
470 TT=TT-1
480 IFTT<=0THENRETURN
490 GOTO420
READY.
```

CalcResult

THE 3D SPREAD SHEET

- Three Dimensional Format
- Up to 32 pages with consolidation
- Pass information between pages
- Split screen and windows
- Formatted Printing
- Formula Editing and protection
- Histograms on screen and printer
- Your current VisiCalc data and formula files can be input
- Help functions on screen

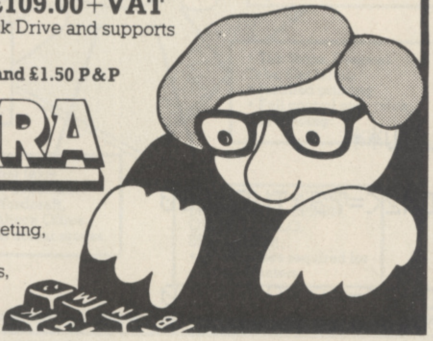
8000 Version £149.00+VAT
(8032, 8096, 8050, 8250 9060 and 9090 supported)

64 Version £109.00+VAT
(Requires 1541 Disk Drive and supports serial printer)

Please add VAT and £1.50 P&P

KOBRA

Send cheques to:
Kobra Micro Marketing,
P.O. Box 28,
Henley-on-Thames,
Oxon.
Tel: 04912 2512



80 COLUMNS NOW AVAILABLE

PETS 3000/4000 9IN SCREENS
(BASIC 4)
EASY TO FIT BOARD
YOUR PET THINKS IT IS AN 8032!!!

£169.95 inc VAT

FOR RADIO AMATEURS. RTTY MODULES

SEND/RECEIVE VERSIONS
PETS/VIC20/CBM64
FROM £69.95
FURTHER INFO FROM:-

T.A.L. COMPUTER DIV
11 HIGH STREET
LEIGHTON BUZZARD
BEDS.
Tel: (0525) 372114

'SIMPLY WRITE': the kind of word processor you didn't think you could afford. Some £300 programs have fewer facilities. Tape or disk; any printer; any 40 or 80 column PET. Needs 16K. **Tape £40, disk £45.**

'SIMPLY FILE' Records System (DBMS). Selects by any key. Prints alphabetical lists, mailing labels, columnar reports of all or selected records. Calculates between fields. Totals, averages columns. Works with 'Simply Write'. Fast, easy, robust and very, very versatile. Disk £65.

GOTTA PET? ADDA VIC! High resolution graphics, programmable characters, colour and sound for your PET/CBM system? All this PLUS a complete extra computer using your PET's disk drives, printer etc? Under £200 including VIC computer and our 'SIMPLY LINK' PET-VIC link system.

for PET
professional computer
3032 Series

A WINDOW ON YOUR DISK! Our 'Simply Recover' disk file repair kit (4040 only at present) will allow you to save crashed files, append BASIC or m/c subroutines, change disk names and IDs, devise protection systems, etc. Disk & detailed instructions £17.

ZYGIAN INVADERS. Super second generation machine code invaders game.

Tape £6, disk £7.50

ASTEROID PATROL. Classic game with sound effects, 9 levels of play, hyper-space jump etc. Tape £6, disk £7.50

ADD VAT TO PRICES PLEASE, BUT ALL INCLUDE P&P. SEND FOR MORE DETAILS, MORE ITEMS, AND GET OUR FREE 'MICROMAIL' PET/VIC NEWSLETTER.

Simple Software Ltd.
15 Havelock Rd., Brighton.
Sussex BN1 6GL
Tel: (273) 504879

Low price high quality software for Commodore 32K Pet & 64

Integrated accounting systems, Purchase ledger, Sales ledger, Invoice printing, Statements, Trade and early settlement discounts, Payroll with SSP and seven overtime/piece work rates, Stock control, Cash Book, Nominal ledger, will complete audit trail etc etc.

Purchase & Sales Control £80.00 + VAT

Runs both purchase and sales ledgers with optional circulation of VAT from the gross or nett amount, analysis by accounting period, "Due for payment report," totals for NETT VAT and gross. Print invoices on your own stationery laid out according to your own instructions. Suitable for small businesses only. Any 32K Pet or 64.

Stock Control £60.00 + VAT
Nominal Ledger £60.00 + VAT

Produces trial balance and up to twenty reports in addition to Profit and Loss and Balance sheet. This programme can be used on its own and it can read files set up by our Purchase and Sales control.

Write or phone for further details

ELECTRONIC AIDS (TEWKESBURY) LTD

Mythe Crest, The Mythe, Tewkesbury
Gloucestershire GL20 6EB
Tel: 0386 831020/0684 294003

```
2000 REM
2010 REM
2020 REM *********************************
2030 REM *ROUTINE TO PLOT DOUBLE         *
2040 REM *DENSITY LINES ON THE SCREEN.   *
2050 REM *MOSTLY FOLLOWS BASIC CODE IN   *
2060 REM *'LIBRARY OF PET SUBROUTINES'   *
2070 REM *PP.55-56; ST.2000-2380.        *
2080 REM *                               *
2090 REM *X1 IN LOCATION 684             *
2100 REM *Y1 IN LOCATION 685             *
2110 REM *X2 IN LOCATION 686             *
2120 REM *Y2 IN LOCATION 687             *
2130 REM *                               *
2140 REM *0 IN LOCATION 703 TO ADD LINE*
2150 REM *1 IN LOCATION 703 TO REMOVE    *
2160 REM *2 IN LOCATION 703 TO DRAW      *
2170 REM *  DOTTED LINE                  *
2180 REM *                               *
2190 REM *ERROR FLAG IN LOCATION 704     *
2200 REM *1 = X1 OUT OF RANGE            *
2210 REM *2 = X2 OUT OF RANGE            *
2220 REM *3 = Y1 OUT OF RANGE            *
2230 REM *4 = Y2 OUT OF RANGE            *
2240 REM *                               *
2250 REM *COLOUR IN LOCATION 786         *
2260 REM *                               *
2270 REM *DOES NOT WRITE OVER TEXT       *
2280 REM *ALREADY ON THE SCREEN.         *
2290 REM *                               *
2300 REM *ROUTINE CALLS PPOINT.          *
2310 REM *                               *
2320 REM *ROUTINE CALLED BY SYS(30592)   *
2330 REM *********************************
2340 I=30592:T=0
2350 READ A
2360 IF A=-1 THEN 2400
2370 POKE I,A:T=T+A
2380 I=I+1
2390 GOTO 2350
2400 PRINT"▮ROUTINE 2:"
2410 IFT=38220THENPRINT"▮▮ENTERED O.K.":GOTO2950
2420 PRINT"▮▮ENTERED INCORRECTLY"
2430 END
2440 DATA72,152,72,138,72,169,255
2450 DATA141,171,2,173,172,2,201
2460 DATA80,144,5,160,1,76,217
2470 DATA120,173,174,2,201,80,144
2480 DATA5,160,2,76,217,120,173
2490 DATA173,2,201,50,144,5,160
2500 DATA3,76,217,120,173,175,2
2510 DATA201,50,144,5,160,4,76
2520 DATA217,120,173,174,2,56,237
2530 DATA172,2,141,176,2,173,175
2540 DATA2,56,237,173,2,141,177
2550 DATA2,169,1,141,178,2,141
2560 DATA179,2,173,177,2,16,10
2570 DATA160,255,140,178,2,73,255
2580 DATA24,105,1,141,180,2,173
2590 DATA176,2,16,10,160,255,140
2600 DATA179,2,73,255,24,105,1
2610 DATA141,181,2,173,181,2,56
2620 DATA237,180,2,141,182,2,16
2630 DATA35,169,255,141,183,2,169
2640 DATA0,141,184,2,173,180,2
2650 DATA141,185,2,173,181,2,141
2660 DATA186,2,173,176,2,48,5
2670 DATA169,1,141,183,2,76,73
2680 DATA120,169,0,141,183,2,169
2690 DATA255,141,184,2,173,181,2
2700 DATA141,185,2,173,180,2,141
2710 DATA186,2,173,177,2,48,5
2720 DATA169,1,141,184,2,173,185
2730 DATA2,141,187,2,56,237,186
2740 DATA2,141,188,2,173,186,2
2750 DATA141,189,2,78,185,2,173
2760 DATA186,2,56,237,185,2,141
2770 DATA190,2,173,172,2,141,169
2780 DATA2,173,173,2,141,170,2
2790 DATA173,191,2,208,4,169,0
2800 DATA240,13,201,1,208,4,169
2810 DATA1,208,5,173,171,2,73
2820 DATA255,141,171,2,32,160,118
2830 DATA173,190,2,16,30,24,109
2840 DATA189,2,141,190,2,173,172
2850 DATA2,24,109,184,2,141,172
2860 DATA2,173,173,2,24,109,183
2870 DATA2,141,173,2,76,207,120
2880 DATA56,237,188,2,141,190,2
2890 DATA173,172,2,24,109,179,2
2900 DATA141,172,2,173,173,2,24
2910 DATA109,178,2,141,173,2,206
2920 DATA187,2,48,3,76,105,120
2930 DATA160,0,140,192,2,104,170
2940 DATA104,168,104,96,-1
2950 POKE51,0:POKE52,112
2960 POKE55,0:POKE56,112:CLR:NEW
READY.
```

Moonlander

Try to land your spaceship on the surface of the moon. This takes great skill to get the landing speed correct and not to run out of fuel.

To control the fuel 'spent', use the keys from 0 to 9 (9 uses the most fuel) and 5 keeps a constant speed. You must land the craft at a speed of 15 or less km/h.

```
10 READ A:POKE2040,A:NO=A
20 FORI=0TO62:READ A
30 POKENO*64+I,A:NEXT
40 V=53248:POKEV,164
50 POKEV+1,72:POKEV+23,1:POKEV+29,1
60 POKEV+39,1:POKEV+32,0
70 POKEV+33,0:
100 POKE53272,21
200 REM LUNAR LANDER
300 PRINT"▒▯"
400 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
500 PRINT"                    * ▒LUNAR LANDING▒ *
600 PRINT"*▒GAME TO TEST YOUR SKILL AND JUDGEMENT▒*"
700 PRINT:PRINT:PRINT
900 FORZX=1TO5000:NEXT
1000 PRINT"▯"
1400 P1=0
1500 C$="▯▒▒▒▒▒▒▒▒▒▒▒▒▮▮▮▮▮▮▮":GOTO7500
1600 I4=I5:P1=P1+1:ABC=ABC+1
1700 GOSUB11000
1800 PRINT"▒"
1900 TH=0:T=0
2000 PO1=0
2100 X0=52800
2200 V0=-176:F=1:S=1
2300 GOSUB5100
2400 GOSUB21500
2500 AT=TI:AG=TI
2600 GETR$:IFR$<>""THENR=VAL(R$)
2700 IF(TI-AT)>30THENAT=TI:GOTO2900
2800 GOTO2700
2900 T=T+R
3000 TH=TH+1
3100 A=5.4*(1-0.2*R)
3200 X=V0+0.5*A:X0=X0+X
3300 IFX0>0THEN3500
3400 X=X-X0:F=0:X0=0
3500 D=V0*V0-2*X*A
3600 IFD>0THEN3800
3700 D=-D:S=-1
3800 V0=SQR(D)*S*SGN(X)
3900 S=1
4000 GOSUB13000
4100 IFV0>0THENPRINT"▒";
4200 PRINT"▒▒▒▒▮▒";MID$(STR$(V0),2,5)"▒";
4300 PRINTLEFT$(STR$(X0)+A$(0),7)
4400 PRINT"▒▒"
4500 PRINT"▯▮";2500-T"▮   ▮▮"TAB(8);TH
4600 GOSUB6900:IFF=0THENGOSUB11500:GOTO63999
4700 IFT>2500THENR=0:GOTO3000
4800 GOTO2600
4900 GOSUB13000
5000 GOTO10600
5100 REM
6300 PRINT"▒ ___________________"
```

MR CHIP SOFTWARE

JACKPOT. This is it. The ultimate fruit machine program for the Vic, with nudge, hold and re-spin, one hundred percent machine code. **"Jackpot** is a beautifully written simulation giving superb graphics, animation and use of colour. In fact, this program makes Commodore's fruit machine cartridge look unbelievably cheap and nasty." HCW issue 20 19/7/83.

KWAZY KWAKS. Accurancy and speed are required for this shooting gallery, superb use of colour and graphics in this new and challenging game from the author of **Jackpot,** one hundred percent machine code. Joystick or key-board control.

UNEXPANDED VIC20

BUGSY (JOYSTICK ONLY). You are in a minefield; collect all the yellow bombs before the time runs out by moving on the blue stepping stones. Gain extra time and score by collecting the purple boxes but watch out for the mines marked with red cross-bones. Sounds easy? EVERY STONE YOU STEP on disappears, as you move around the screen you leave an empty trail but not to worry, a lovable little green creature called BUGSY moves around randomly filling in the empty spaces, but, run into him and he turns nasty and you are dead. Clear the screen and another appears with more mines. How long can you stay alive? Very original, compulsive and challenging game £5.50

MINY/ROULETTE-PONTOON. High-Low three great games of chance for the VIC20. Try to beat the computer, hours of fun, full colour, sound effects and tunes. Are you a compulsive gambler? If so, we promise you will not lose your shirt with these three programs £5.50

DATABASE. Create your own files and records on tape £7.50

BANK MANAGER. Computerise your bank account £5.00

SUPER BANK MANAGER. A full feature version, needs 3K expansion, but will run on any memory size £7.50

M/C SOFT. Machine code monitor and disassembler, any memory size £7.50

CHARACTER EDITOR. With our own window facility £4.50

COMMODORE 64 GAMES AND UTILITIES

LUNAR RESCUE – Our own version of that popular arcade game £5.50

PONTOON – ROULETTE – ACES HIGH. More powerful versions, that make three great games of chance for the 64 .... £7.50

M/C SOFT 64 – Assembler and Disassembler, with decimal to hex converter, everything our program for the VIC will do and more £7.50

BANK MANAGER 64 – As our Super Bank Manager, but for the 64 .... £7.50

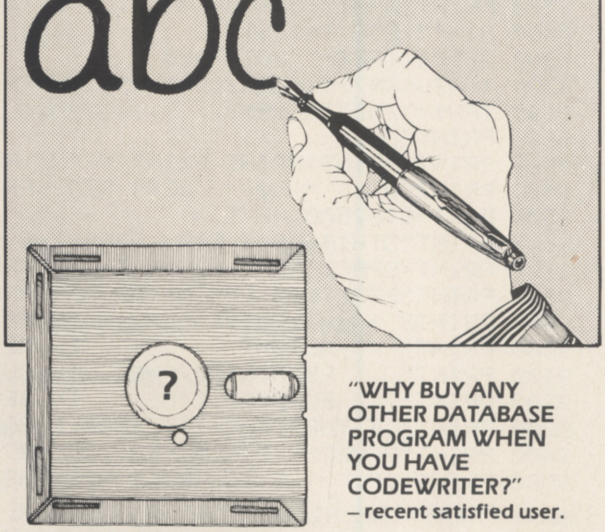
NOW AVAILABLE ON DISK WITH EXTRA FACILITIES £10.00

Full documentation with all utility programs.
Send for free brochure.

CHEQUES/POs TO:
MR CHIP SOFTWARE, DEPT CC, 1 Neville Place,
Llandudno, Gwynedd LL30 3BL.
Tel 0492 49747.

WANTED: High Quality Software of all types.

CodeWriter makes microcomputing as simple as



"WHY BUY ANY OTHER DATABASE PROGRAM WHEN YOU HAVE CODEWRITER?"
– recent satisfied user.

Forget about the expense of hiring a professional programmer or the restrictions of 'off-the-shelf' programs. Become your own program designer producing microsoftware to suit your specific requirements. Codewriter enables you to do this, you type commands in your own everyday language, just as you would write them on paper . . . it's as simple as ABC!

When you've completed your design, Codewriter will write the program code and store it on your own disk whilst you sit back and watch. At anytime, you can of course modify the programs you've designed.

Your programs may include printed reports, calculations and comparisons between fields of data, development of menus, forms, letters, memos, cheques, invoices, statements, mailing labels . . . the possibilities for design are endless. Codewriter operates with most popular micros and will be demonstrated fully at your local dealer.

For details on Codewriter, complete and return the coupon to;

DYNATECH MICROSOFTWARE LTD.

Summerfield House, Vale, Guernsey,
Channel Islands.
Telephone 0481 45934 Telex 4191130.

name ____________________

address ____________________

____

____________________ tel. ____________

BASIC PROGRAMMING

```
6400 PRINT" ▓SPEED HEIGHT■ ":GOSUB6700
6500 PRINT" ▓ FUEL  TIME ■ ":GOSUB6700
6600 RETURN
6700 FORI=1TO2:PRINT" |"TAB(13)"| ":NEXT
6800 PRINT" └─────────────┘ ":RETURN
6900 PRINTTAB(19);:IFR=0THENRETURN
7000 FORI=1TOR:PRINT"▓/⌒\▓▓▓▓";:NEXT:FORI=RTO10:PRINT"    ▓▓▓▓";:NEXT
7100 PRINT"TTTTTTTTTTT";:FORI=1TO10:PRINT"    ▓▓▓▓";:NEXT:RETURN
7200 GOTO63999
7300 PRINT"▣"
7400 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
7500 PRINT"▓I AM A COMPUTER - COMMONLY KNOWN AS 64■"
7600 PRINT:PRINT:PRINT
7700 PRINT"WHAT IS YOUR NAME? - ";
7800 N$="":FOR I=1TO12
7900 GETR$:IFR$=""GOTO7900
8000 IFASC(R$)>64ANDASC(R$)<91THENPRINTR$;:N$=N$+R$:NEXTI
8100 IFN$="ZWZ"THENEND
8200 PRINT"▣"
8300 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
8400 PRINT"O.K. ";N$;", LETS STAY FRIENDLY AND START"
8500 FORI=1TO2500:NEXT
8600 PRINT"▣THIS GAME SIMULATES THE LANDING OF A"
8700 PRINT"SPACECRAFT ABOVE THE LUNAR SURFACE.":PRINT
8800 PRINT"READINGS ON THE GAUGES ARE:"
8900 PRINT"    VELOCITY         IN METERS/SEC"
9000 PRINT"    HEIGHT           IN METERS"
9100 PRINT"    REMAINING FUEL   IN CUBIC METERS"
9200 PRINT"    ELAPSED TIME     IN SECONDS":PRINT
9300 PRINT"IF THE VELOCITY SHOULD APPEAR IN"
9400 PRINT"REVERSE FIELD (EG., ▓256■),YOU ARE GOING"
9500 PRINT"UP.  THE CONTROLS ARE THE NUMBER KEYS."
9600 PRINT"THE HIGHER THE NUMBER,THE HARDER YOU"
9700 PRINT"THRUST.  A THRUST OF 5 WILL EXACTLY"
9800 PRINT"BALANCE GRAVITY, ALLOWING YOU TO FALL"
9900 PRINT"AT A CONSTANT RATE.  THE OBJECT IS TO"
10000 PRINT"LAND AT A SPEED OF LESS THAN 15 METERS/SEC.":PRINT
10100 PRINT"YOU START AT 52800 METERS, FALLING AT A"
10200 PRINT"RATE OF 176 METERS/SEC, WITH 2500 UNITS"
10300 PRINT"OF FUEL.  IF YOU RUN OUT OF FUEL, YOU"
10400 PRINT"WILL FALL LIKE A ROCK!":PRINT
10500 PRINT"DO YOU UNDERSTAND, ";N$;"(Y/N)?";
10600 GETR$:IFR$="Y"THENPOKEV+21,1:GOTO1600
10700 IF R$<>"N"GOTO10600
10800 PRINT:PRINT"▓READ THE INSTRUCTIONS CAREFULLY!■"
10900 FORJ=1TO1000:NEXTJ:GOTO8600
11000 PRINT"▣"
11100 FORI1=1TO14
11200 PRINTTAB(39*RND(1));"."
11300 NEXTI1
11400 RETURN
11500 IFV0<-15THEN11700
11600 Q=0:GOTO11900
11700 Q=1:FORI=1TO500:NEXTI:GOSUB21900
11800 GOTO12200
11900 FORI=1TO500:NEXTI:GOSUB21900
12000 PRINT:PRINT"▓▓▓▓▓▓CONGRATULATIONS, YOU LANDED SAFELY":GOTO12200
12100 GOSUB21900
12200 IFP1>=2THENGOTO12700
12300 PRINT:PRINT"DO YOU WANT TO TRY AGAIN, ";N$;"?";
12400 GETR$:IFR$="N"THEN12900
12500 IFR$="Y"THENPOKEV+21,1:GOTO1600
12600 GOTO12400
```

BASIC PROGRAMMING

```
12700 PRINT:PRINT"THANKS FOR THE GAME - HOPE YOU'LL PLAY  AGAIN SOMETIME ";N$
12800 END
12900 PRINTC$;"████████OK████BYE":END
13000 REM
13100 IFV0<=-2400THENPOKEV+21,0:GOTO14600
13200 IFX0>69000THENPOKEV+21,0:GOTO13800
13300 IFX0>23000THEN14800
13400 IFX0>2300THEN16200
13500 IFX0>230THEN17600
13600 IFX0>0THEN18900
13700 POKEV+21,0:RETURN
13800 PRINT"█████████OUT OF MOONS INFLUENCE!!"
13900 PRINT"████UNABLE TO RESUME LUNAR LANDING!!"
14000 PRINTSPC(31);"█████";
14100 FORI=1TO75
14200 PRINT"███████████████████████████MISSION ABORTED!!!!!!!!";
14300 PRINT"███████████████████████████                   ";
14400 NEXTI
14500 GOTO12200
14600 PRINT"██████████████████LANDER HAS REACHED "
14700 PRINT"█ESCAPE VELOCITY OF 2.4 KILOMETERS/SEC!!":GOTO13900
14800 IFPO1=1THEN16000
14900 PRINT"██";SPC(34);
15000 PRINT"├       ████████├6000████████├      ████████├6000████████├";
15100 PRINT"      ███████";
15200 PRINT"██├5400████████├      ███████├4800████████├███├";
15300 PRINT"42000███████";
15400 PRINT"██├███├3600████████├███├3000████████├";
15500 PRINT"██";
15600 PRINT"██├2400████████├███├1800████████├███├";
15700 PRINT"12000███████";
15800 PRINT"██├███├6000 ████████├███  ├██";
15900 PO1=1
16000 GOSUB20100
16100 RETURN
16200 IFPO1=2THEN17400
16300 PRINT"██";SPC(34);
16400 PRINT"├      ████████├22000████████├      ████████├20000████████├";
16500 PRINT"██";
16600 PRINT"██├18000████████├      ██████ ██├16000████████├███├";
16700 PRINT"14000███████";
16800 PRINT"██├███├12000████████├███├10000████████├";
16900 PRINT"██";
17000 PRINT"██├8000 ████████├███├6000 ████████├███├";
17100 PRINT"4000 ███████";
17200 PRINT"██├███├2000 ████████├ ████├██";
17300 PO1=2
17400 GOSUB20100
17500 RETURN
17600 IFPO1=3THEN18800
17700 PRINT"██";SPC(34);
17800 PRINT"├      █████████ ├2200 █████████ ├    █████████ ├2000 █████████ ├";
17900 PRINT"██";
18000 PRINT"██├1800 ████████├      █████████ ├1600 █████████ ├███  ├";
18100 PRINT"1400 ████████";
18200 PRINT"██ ├███ ├1200 █████████ ├███ ├1000 █████████ ├";
18300 PRINT"███";
18400 PRINT"██ ├800  █████████ ├███ ├600  █████████ ├███├";
18500 PRINT"400  ████████";
18600 PRINT"██ ├███ ├200  █████████ ├ ████ ├██";
18700 PO1=3
18800 GOTO20100
18900 IFPO1=2THEN63999
```

Master 700

PRICE ONLY
£295+VAT!

MASTER is a totally new concept... a complete program development package! Available NOW for the CBM 700, Master has 85 new commands... PLUS Toolkit functions, Business Basic, keyed disk access, screen management, memory management, user-definable input zones, report generator, 22-place arithmetic, date control, data compression, string search, screen plotting, screen dump, optional software protection key, and more... Master is supplied with a full User Reference Manual, Quick Reference guide and demo programs, and supports all CBM disk models from 4040 to 9090. Master is also available for CBM models 4032/8032/8096, and CBM 64!

Superscript 700

OUR PRICE ONLY
~~£450~~ £350+VAT!

SuperScript is the complete document preparation and storage system, making optimum use of memory and disk space... and it's available NOW for the Commodore 700 computer, with a host of new features, including arithmetic and built-in spelling checker... In short, it offers all the advantages of a professional word-processing system, at a price that cannot be ignored!

Master and SuperScript are just two of our fine CBM software products... please telephone or write for a free catalogue! ORDERING INFORMATION: ADD 15% VAT TO QUOTED PRICES & ORDER BY POST/TELEPHONE/PRESTEL, USING CHEQUE, ACCESS, BARCLAY CARD OR OFFICIAL ORDER. TELEPHONE 01-546-7256 FOR SAME-DAY DESPATCH. POSTAGE FREE EXCEPT ON CREDIT OR OVERSEAS ORDERS. (REF A18)

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY KT2 7QT TEL 01-546-7256

HOTEL SYSTEM

We are pleased to introduce our NEW HOTEL ACCOUNTING SYSTEM incorporating:-

This system was designed by a hotelier for hotels. Terms are posted automatically on each date change along with any morning tea or newspaper orders.

GUEST BILLING features Automatic Tariff and a price look-up for 1000 items.

STOCK CONTROL keeps full records of Stock and Sales and will produce Stock Lists, Low Stock Reports, Order Forms etc.

Full GUEST RECORDS are stored, showing Name and Address, Last Arrival and Departure Dates, Last Room Occupied, Amount of Last Invoice, Number of Stays and the Total Amount Spent.

These can be viewed when necessary.

The WORD PROCESSOR can be used for producing Daily Menus, Wine Lists, Memos, Arrival and Departure Lists and Circular Letters.

Information from the main GUEST RECORDS or FILING SYSTEM files can be automatically inserted into Letters.

The price for this complete system, the computer, floppy disk drives, printer, first 2000 bill sheets and staff training is from **£3100.00** + VAT, depending on choice of printer.

Now available on Commodore 700 series from **£3300.00** + VAT

For further information please contact Paul Southcott on 0323 843737.

The System will be on Stand 10 at Hotech 83, Hotel Russell, LONDON 28th and 29th September. Complimentary tickets available.

Southcott Software Services

Glyndley Manor, Hankham, Pevensey, East Sussex BN24 5BS
Telephone: (0323) 843737 Telex: 877440 Ref. SSS

SOFTEX COMPUTER ACCESSORIES

37 Wheaton Road,
Bournemouth BH7 6LH, U.K.
Telephone: (0202) 422028

QUALITY SOFTWARE

Probably the world's cheapest Vic Printer! Put a Sinclair ZX Printer (order Printer & Power supply from Sinclair or many High Street Stores – R.R.P. £48) on your VIC using the

SOFTEX PRINTERFACE

Costing only ... £19.95 + £1 P&P
Complete system ... £68.95 + £2.95 P&P

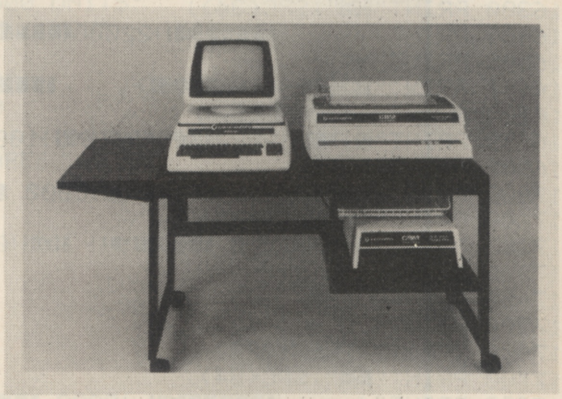
- *** Very high resolution graphics (higher than Vic!)**
- *** Full Vic/Pet character set + user-defined graphic characters**
- *** 43 Colomn Printer with superb formatting facilities**
- *** Operating commands same as Commodore Vic printer**
- *** Simple to use! No extras required**

Send orders/enquiries (dealer enquiries welcome) to:

SOFTEX COMPUTERS
Dept. C1, 37 Wheaton Road,
Bournemouth BH7 6LH
Tel: 0202 422028

CBM-64 Version coming soon!

Put your computer on a Crompton Desk



A Commodore approved product.

Specially designed to take any Commodore Pet system.

Black leathercloth top and Black metal frame.

Paper feed tray, top extension shelf. Concealed cables and 4 way 13 amp plug socket.

Mounted on castors. Size 1475 × 675 × 720 mm

Delivered flat packed.

Price £205.00 includes VAT and delivery.

This offer available UK only. Cheques with order to:

**Tirith Ltd, Pear Tree House,
Woughton on the Green, Milton Keynes
MK6 3BE. Telephone: (0908) 679528**

```
19000 PRINT"██";SPC(34);
19100 PRINT"├      ████████├220  ████████ ├     ████████ ├200  ████████ ├";
19200 PRINT"██";
19300 PRINT"█ ├180  ████████ ├██ ├160  ████████ ├██ ├";
19400 PRINT"140  ███████";
19500 PRINT"█ ├██ ├120  ████████ ├██ ├100  ████████ ├";
19600 PRINT"██";
19700 PRINT"├80   ████████ ├█├60   ████████ ├█├";
19800 PRINT"40   ███████";
19900 PRINT"█ ├██ ├20   ████████ ├ ███ ├0█";
20000 PO1=4
20100 GOSUB21100
20200 PRINT"█";SPC(33);
20300 IFPO1=1THENLEV=3000
20400 IFPO1=2THENLEV=1000
20500 IFPO1=3THENLEV=100
20600 IFPO1=4THENLEV=10
20700 IFPO1=0THENRETURN
20800 NUM=23-ABS(INT(X0/LEV))
20900 FORI=1TONUM:PRINT"█";:NEXTI:PRINT"█♠";:IFR>0THENPRINT"██V";
21000 RETURN
21100 PRINT"█";SPC(33);
21200 PRINT" ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ██ ";
21300 PRINT"██ ██ █";
21400 RETURN
21500 PRINT"█████████████████████"
21600 A=TI
21700 PRINT"                                        ":R=0
21800 RETURN
21900 PRINT"██"
22000 FORI=1TO25
22100 PRINTTAB(RND(1)*40);"."
22200 NEXTI
22300 PRINT"   ◢▀▀█      ◢▀▀█          "
22400 PRINT"  ◢   ▀█  ◢    ▀█                          ◢▀▀█  "
22500 PRINT"█            ▀█                         ◢   ▀█    "
22600 PRINT"█                                           ▀█◢ "
22700 PRINT"█                                            █";
22800 PRINT"█████████████=♠██V";
22900 FORI=1TO8
23000 FORJ=1TO500
23100 NEXTJ
23200 PRINT"██ ██ ██♠██V";
23300 NEXTI
23400 PRINT"██ ██ ██♠"
23500 PRINT"███████████████████████";
23600 IFQ=1THEN24400
23700 FORI=1TO150
23800 PRINT"████████████████PERFECT LANDING";
23900 PRINT"█████████████████PERFECT LANDING█";
24000 NEXTI
24100 FORI=1TO500:NEXTI
24200 PRINT"█"
24300 RETURN
24400 PRINT"█████████████████████████████♠";
24500 FORI=1TO25
24600 PRINT"*██ ███*██ ██*██ * ██";
24700 PRINT" ███*██ ███*██ ██* *██";
24800 PRINT"█ ███*██ ███*██ ██* *███";
24900 PRINT"█*██ ███*██ ██*██ * ███";
25000 PRINT"*██ ███*██ ██*██ * ██";
25100 PRINT"*██ ███*██ ██*██ * ██";
25200 PRINT"█*██*███*███*██*██* * *██ ███";
```

```
25300 PRINT"█ ███ ███ ███ ███ ███ █ █ ███";
25400 NEXTI
25500 PRINT" ███ ███ ▌ ██ ██████████████";
25600 FORJ=1TO35
25700 PRINT"YOU JUST MADE A NEW CRATER ON THE MOON";
25800 PRINT"████████████████████████████████████████";
25900 PRINT"█YOU JUST MADE A NEW CRATER ON THE MOON█";
26000 PRINT"████████████████████████████████████████";
26100 NEXTJ
26200 FORI=1TO1000:NEXTI
26300 PRINTC$;"███I THINK YOU CRASHED"
26400 FORI=1TO1000:NEXTI
26500 RETURN
30000 DATA254
30001 DATA0,6,0,0,6,0,0
30002 DATA4,0,0,60,0,0,126
30003 DATA00,0,255,0,0,255,0
30004 DATA0,207,0,0,207,0,0
30005 DATA255,0,0,255,0,0,255
30006 DATA0,1,50,128,2,238,192
30007 DATA6,238,224,15,50,240,31
30008 DATA255,248,2,126,64,4,195
30009 DATA32,9,195,144,19,195,200

READY.
```

Starfleet Command

Imagine that you are the captain of the starship Enterprise. Your mission is not to 'Boldly go where no man has been before' but to destroy the Klingons. All of the commands are explained in the program.

```
90 POKE53272,21:POKE53280,6:POKE53281,7
100 PRINT"█▌"
110 PRINT"█████████"
120 PRINT"    ***********************************
130 PRINT"    ** █WELCOME TO STARFLEET COMMAND█ **
140 PRINT"    ***********************************
150 PRINT:PRINT
180 FORJ=1TO5500:NEXT
190 K1=3.14169/180
200 Q1=3:Q2=3:D=100000:P1=100:P2=100
210 I1=100
220 A1=INT(180*RND(5))-90:A2=-(180-A1)
230 I2=100:L1=100:L2=100:S1=100:S2=100
240 W1=100:W2=100
250 POKE53272,23
260 PRINT"▌              *█STAR TREK█* - "
265 PRINT"█TEST YOUR SKILL AS A STARSHIP COMMANDER █"
270 PRINT
280 PRINT"IMAGINE THAT YOU ARE CAPTAIN JAMES T.   KIRK.
285 PRINT" THIS GAME SIMULATES IN
290 PRINT"STRIKING DETAIL A SPACE BATTLE WITH
295 PRINT"THE KLINGON FORCES. THE KLINGONS
300 PRINT"ARE ATTACKING YOUR SHIP AND YOU MUST
305 PRINT"DEFEND YOURSELF.
310 PRINT
```

COMMODORE 64 GAMES ARE NOW AVAILABLE ON DISKETTE FOR ONLY £2.00 EXTRA

6 NEW GAMES FOR YOUR commodore 64

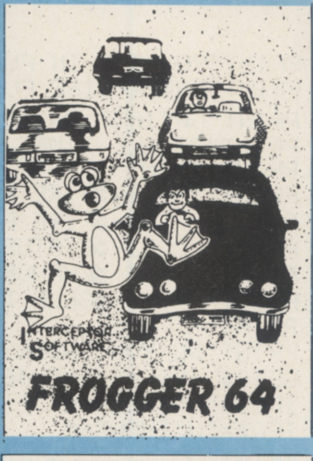
INTERCEPTOR MICRO'S

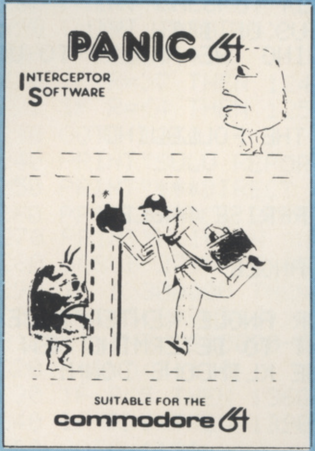
PRESENTS

SEND S.A.E.
FOR FULL LIST OF GAMES

SCRAMBLE 64
WRITTEN IN MACHINE CODE
INTERCEPTOR SOFTWARE
SUITABLE FOR THE
commodore 64

SOFTWARE
STAR TREK
commodore 64


INTERCEPTOR SOFTWARE
FROGGER 64


PANIC 64
INTERCEPTOR SOFTWARE
SUITABLE FOR THE
commodore 64

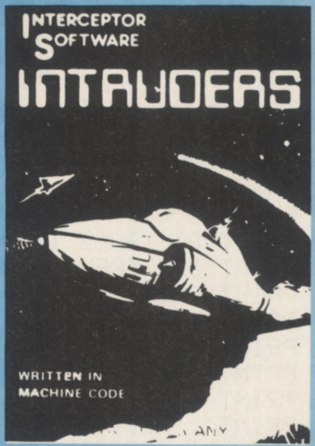
CRAZY KONG
INTERCEPTOR SOFTWARE
WRITTEN IN MACHINE CODE
SUITABLE FOR THE
commodore 64

SPRITE MAN
WRITTEN IN MACHINE CODE
SUITABLE FOR THE
commodore 64

FIGHTER PILOT
INTERCEPTOR SOFTWARE
ATARI

WORD HANGER
BASIC CARTRIDGE

2 NEW GAMES FOR YOUR ATARI 400/800–16K


INTERCEPTOR SOFTWARE
INTRUDERS
WRITTEN IN MACHINE CODE

NEW GAME FOR YOUR BBC MODEL B

jupiter defender
WRITTEN IN MACHINE CODE
SUITABLE FOR THE UNEXPANDED VIC 20

NEW VIC 20 GAMES

Mr, Mrs, Miss
Address

Quantity	Item		Total		Item		Total
	Scramble 64	£7.00			Galaxzions VIC-20	£5.00	
	Star Trek 64	£7.00			Fantazia VIC-20	£6.00	
	Frogger 64	£7.00			Crazy Kong VIC-20	£6.00	
	Panic 64	£7.00			Frog VIC-20	£4.00	
	Crazy Kong 64	£7.00			Alien Attack VIC-20	£6.00	
	Spriteman 64	£7.00			Vic Rescue VIC-20	£5.00	
	Fighter Pilot Atari	£7.00			Penny Slot VIC-20	£4.50	
	Wordhanger Atari	£5.00					
	Intruders BBC	£5.00					
	Jupiter Defender	£6.00					
					P&P	50	
					Total		

Send Cheque/P.O. with Order to: Interceptor Micro's, Lindon House, The Green, Tadley, Hants.

Postage & Packing .50p

cci Sept

STOP PRESS 1 NEW VIC 20 FALCON FIGHTER STOP PRESS STOP PRESS
ONLY £6.00

```
320 PRINT"YOU ARE IN FULL CONTROL OF THE
325 PRINT"ENTERPRISE FUNCTIONS. YOU HAVE FIVE
330 PRINT"OPTIONS ON YOUR COURSE OF ACTION
335 PRINT"AT ALL TIMES. THESE OPTIONS ARE:-
340 PRINT:PRINT
350 PRINT"     1-▓FIRE PHASERS          ■
370 PRINT"     2-▓FIRE PHOTON TORPEDOS
390 PRINT"     3-▓STATUS REPORT         ■
410 PRINT"     4-▓CHANGE MOVEMENT       ■
430 PRINT"     5-▓SELF DESTRUCT         ■
440 PRINT
450 PRINT"DO YOU UNDERSTAND? (Y/N)";
460 GETQ$:IFQ$=""THEN460
470 IFQ$="Y"THEN490
480 IFQ$="N"THEN260
490 PRINT"□"
500 PRINT"THE STATUS REPORT DETAILS THE POSITION  AND STATUS OF BOTH YOU
510 PRINT"AND THE KLINGONS. IT WILL ASSIST YOU IN DETERMINING THE ANGLES TO USE
520 PRINT"WHEN FIRING YOUR WEAPONRY.
530 PRINT
540 PRINT"TO FIGURE OUT THE ANGLE OF ATTACK YOU   CAN USE THE FOLLOWING
550 PRINT"FORMULAS ALONG WITH THE STATUS REPORT:-
560 PRINT
570 PRINT" ENTERPRISE ANGLE + ENTERPRISE TURN =   NEW ENTERPRISE ANGLE
580 PRINT
590 PRINT" KLINGON ANGLE + KLINGON TURN = NEW     KLINGON ANGLE
600 PRINT
610 PRINT"TO DETERMINE THE ANGLE TO SHOOT AT YOU  TAKE YOUR ANGLE (ENTERPRISE)
620 PRINT"PLUS THE KLINGONS ANGLE. IT IS VERY     IMPORTANT TO DETERMINE NEW
630 PRINT"ANGLES BEFORE EVERY FIRING SO YOU CAN   SHOOT THE KLINGONS DOWN.
640 PRINT
650 PRINT"DO YOU UNDERSTAND?(Y/N)";
660 GETQS$:IFQS$=""THEN660
670 IFQS$="Y"THEN690
680 IFQS$="N"THEN490
690 PRINT"□"
700 PRINT"AT EVERY OPTION, A NEW ANGLE OF MOVEMENTIS CALCULATED. IF EITHER
710 PRINT"YOU OR THE KLINGONS CHANGES DIRECTION   YOU SHOULD GET A STATUS REPORT
720 PRINT"TO FIND OUT THE NEW ANGLE OF ATTACK
730 PRINT"OBVIOUSLY AN ANGLE OF 0 DEGREES WILL
735 PRINT"NEVER CHANGE YOUR CURRENT ANGLE.
740 PRINT
750 PRINT"DISTANCE IS ONLY IMPORTANT IF YOU BLOW  YOURSELF UP. WARPS MAKE NO
760 PRINT"DIFFERENCE EXCEPT THAT THEY AFFECT YOUR DISTANCE FROM THE KLINGONS
770 PRINT:PRINT:PRINT
780 PRINT"***************************************
790 PRINT"**▓GOOD HUNTING - THE GALAXY NEEDS YOU■**
800 PRINT"***************************************
810 PRINT:PRINT:PRINT:PRINT:PRINT
820 PRINT"  KEY 'S' TO START THE GAME WHEN READY";
830 GETQSQ$:IFQSQ$=""THEN830
840 IFQSQ$<>"S"THEN690
850 IFQSQ$="S"THEN860
860 PRINT"□"
870 PRINT"YOUR OPTIONS ARE:-
880 PRINT:PRINT
890 PRINT"1 - FIRE PHASERS
900 PRINT"2 - FIRE PHOTON TORPEDOS
910 PRINT"3 - STATUS REPORT
920 PRINT"4 - CHANGE DIRECTION
930 PRINT"5 - ▓SELF DESTRUCT■
940 PRINT:PRINT:PRINT:PRINT:PRINT
950 PRINT"WHAT IS YOUR OPTION";
960 INPUT O9
970 IF O9=1 THEN 1080
980 IF O9=2 THEN 1280
990 IF O9=3 THEN 1620
1000 IF O9=4 THEN 1740
```

```
1010 IF O9=5 THEN 1800
1020 PRINT"WHAT?":GOTO 920
1030 IF A<1 THEN 920
1040 R=RND(1)*10
1050 IF R<4THEN 1080
1060 IF R>7 THEN 1280
1070 GOTO 1620
1080 GOSUB 2790:IF ABS(A-A1)>10 THEN 1410
1090 IF D>150000 THEN 1550
1100 C=INT(3*RND(2))+1:
1110 H1=2*INT((150000-D)/30000)
1120 R=RND(3)*10
1130 IF R<4 THEN 1160
1140 IF R>8 THEN 1180
1150 GOTO 1190
1160 PRINT"PHASERS SCORE DIRECT HIT!!!!"
1170 PRINT"GOOD SHOOTING !":GOTO 1850
1180 PRINT"CHECKOV REPORTS A DIRECT HIT BY PHASERS":GOTO1850
1190 C=INT(3*RND(4))+1:
1200 R=RND(5)*10
1210 IF R=>7 THEN 1240
1220 IF R=<4 THEN 1250
1230 GOTO 1260
1240 PRINT"SULU REPORTS DIRECT HIT!":GOTO1850
1250 PRINT"***DIRECT HIT***":GOTO 1850
1260 PRINT"SPOCK REPORTS DIRECT HIT ON "
1270 PRINT"KLINGON SHIP!":GOTO 1850
1280 GOSUB 2790:IF ABS(A-A1)>25 THEN 1580
1290 IF D>300000 THEN 1560
1300 C=INT(3*RND(6))+1:
1310 H1=INT((300000-D)/50000):
1320 R=RND(7)*10
1330 IF R<5 THEN 1360
1340 IF R>5 THEN 1390
1350 GOTO 1190
1360 PRINT"PHOTON TORPEDOES"
1370 IF R>5 THEN 1390
1380 GOTO 1190
1390 PRINT"SULU REPORTS DIRECT HIT"
1400 PRINT"BY PHOTON TORPEDOES!":GOTO1850
1410 C=INT(2*RND(8))+1:H1=0:
1420 R=RND(9)*10
1430 IF R=<3.5 THEN 1450
1440 IF R=>3.6THEN 1470
1450 PRINT"CHECKOV REPORTS CLEAN MISS"
1460 PRINT" BY PHASERS!":GOTO 1850
1470 R=RND(11)*10
1480 IF R<3 THEN 1510
1490 IF R>7 THEN 1540
1500 GOTO 1520
1510 PRINT"YOUR SHOT IS WIDE!":GOTO1850
1520 PRINT"SPOCK REPORTS A CLEAN MISS!"
1530 GOTO 1850
1540 PRINT"SULU REPORTS A MISS":GOTO 1850
1550 PRINT"YOU ARE OUT OF PHASER RANGE":GOTO1850
1560 PRINT"YOU ARE OUT OF PHOTON TORPEDO RANGE
1570 GOTO 1850
1580 C=INT(3*RND(12))+1:H1=0:
1590 IF C=1 THEN 1600:IF C<>1 THEN 1470
1600 PRINT"CHECKOV REPORTS A MISS"
1610 PRINT"BY PHOTON TORPEDOES!":GOTO 1850
1620 PRINT"♥":PRINT TAB(5)"***STATUS REPORT***"
1630 PRINTTAB(15)"ENTERPRISE"TAB(30)"KLINGONS"
1640 PRINT"SPEED(WARPS)"TAB(15)Q1 TAB(27)Q2
1650 PRINT"ANGLE"TAB(15)A1 TAB(27)A2
1660 PRINT"TURN"TAB(15)A3 TAB(27)A4
1670 PRINT"LIFE SUPPORT"TAB(15)L1"%"TAB(27)L2"%"
1680 PRINT"WARP DRIVE"TAB(15)P1"%"TAB(27)P2"%"
1690 PRINT"IMPULSE"TAB(15)I1"%"TAB(27)I2"%"
```

```
1700 PRINT"SHIELDS"TAB(15)S1"%"TAB(27)S2"%"
1710 PRINT"WEAPONRY"TAB(15)W1"%"TAB(27)W2"%"
1720 PRINT"MR.SPOCK REPORTS KLINGONS AT"D"K.M.
1730 GOTO 1850
1740 PRINT"WHAT ANGLE DO YOU WANT TO TURN?"
1750 INPUT A3:IF W2<ABS(A3) THEN 1740
1760 PRINT"WHAT WARP FACTOR DO YOU WANT"
1770 PRINT"TO MOVE TO?":INPUT Q1
1780 IF Q1>INT(W1/10)THEN 1760
1790 IF Q1=<INT(W1/10)THEN 1850
1800 IF D<50000 THEN 1830
1810 IF D=>50000 THEN 1820
1820 PRINT"KLINGONS TO FAR AWAY!!!":GOTO 2650
1830 PRINT"KLINGONS & ▒YOU■ DESTROYED!!"
1840 GOTO 2930
1850 PRINT:C=INT(4*RND(13))+1:
1860 IF C=1 THEN 1900
1870 IF C=2 THEN 2130
1880 IF C=3 THEN 2200
1890 GOTO 2240
1900 PRINT"***▒WARNING■***"
1910 PRINT"KLINGONS HAVE FIRED PHASERS!"
1920 IF D>200000 THEN 2070
1930 IF RND(16)>.6THEN 2070
1940 C=INT(100*RND(17))+1:IFC>W2THEN 2070
1950 IFC=<W2 THEN 1960
1960 H2=INT(2*(150000-D)/30000)
1970 C=INT(3*RND(18))+1:
1980 R=RND(19)*10
1990 IF R<4 THEN 2020
2000 IF R>4 THEN 2030
2010 GOTO 2050
2020 PRINT"**▒DIRECT HIT■**":GOTO 2290
2030 PRINT"SPOCK REPORTS YOU SUFFER FROM"
2040 PRINT"A DIRECT HIT!":GOTO 2290
2050 PRINT"SULU REPORTS A HIT ON THE ENTERPRISE!"
2060 GOTO2290
2070 C=INT(2*RND(5))+1:H2=0:
2080 IF RND(1)=<.4 THEN 2100
2090 GOTO 2110
2100 PRINT"CHECKOV REPORTS A MISS.":GOTO 2290
2110 PRINT"SENSORS SHOW KLINGONS SHOT WIDE!"
2120 GOTO 2290
2130 PRINT"***WARNING***"
2140 PRINT"KLINGONS HAVE FIRED PHOTON TORPEDOES!"
2150 IF D>300000 THEN 2070
2160 IF RND(6)>.85 THEN 2070
2170 C=INT(100*RND(5)):IF C>W2 THEN 2070
2180 H2=INT((300000-D)/50000)
2190 GOTO 1970
2200 A4=INT((P2/2)*RND(5)-P2/4):
2210 Q2=INT((P2/10)*RND(2))
2220 PRINT"CHECKOV REPORTS KLINGONS HAVE"
2230 PRINT"CHANGED DIRECTION":GOTO 2290
2240 IF P2>30 THEN 1850
2250 PRINT"KLINGONS HAVE SELF DESTRUCTED!"
2260 IF D>50000 THEN 2680
2270 PRINT"YOU ARE ALSO DESTROYED!!!"
2280 GOTO 2930
2290 A1=A1+A3+A4:Q=A1:GOSUB 2810:
2300 A1=Q:A2=A2+A3+A4:Q=Q2:GOSUB 2810
2310 A2=Q:X=SQR(D↑2+(Q2*5000)↑2-(2*D*Q2*5000*COS(ABS(A2)*K1)))
2320 Y=SQR(D↑2+(Q1*5000)↑2-(2*D*Q1*5000*COS(ABS(A2)*K1)))
2330 D=INT((X+Y)/2)+15000:
2340 H1=H1*3:H2=H2*3:S1=S1-H2:S2=S2-H1:
2350 P1=P1-H2/3:P2=P2-H1/3:
2360 W1=W1-H2/3:W2=W2-H1/3
2370 IF S1<0 THEN 2400
```

```
2380 IF S2<0 THEN 2430
2390 GOTO 2470
2400 PRINT"MR.SCOTT REPORTS SHIELDS ARE OUT!"
2410 K4=1:W1=W1+S1:P1=P1+S1:
2420 I1=I1+S1:L1=L1+S1:S1=0:GOTO 2540
2430 P2=P2+S2:W2=W2+S2:L2=L2+S2
2440 I2=I2+S2:S2=0
2450 PRINT"CHECKOV REPORTS KLINGONS SHIELDS"
2460 PRINT"ARE OUT!":GOTO 2540
2470 IF S1<25 THEN 2500
2480 IF S2<25 THEN 2530
2490 GOTO 2540
2500 PRINT"SCOTTY REPORTS NUMBER 4&6"
2510 PRINT"SHIELDS HAVE BUCKLED!"
2520 GOTO 2540
2530 PRINT"SENSORS SHOW KLINGONS SHIELDS WEAK!"
2540 H1=0:H2=0:IF L1<10 THEN 2570
2550 IF L2<10 THEN 2680
2560 GOTO 2720
2570 R=RND(28)
2580 IF R<3 THEN 2610
2590 IF R>6 THEN 2630
2600 GOTO 2650
2610 PRINT"YOU HAVE BEEN DESTROYED!!!!!!"
2620 PRINT"KLINGONS TAKE OVER!":GOTO2930
2630 PRINT"YOU'VE BLOWN UP!YOU LOSE!"
2640 GOTO 2930
2650 PRINT"YOU LOSE.MR.SCOTT,SULU,CHECKOV,"
2660 PRINT"SPOCK AND UHURA REPORT THAT YOU"
2670 PRINT"ARE AN IDIOT!!!":GOTO 2930
2680 PRINT"KLINGONS ARE DEAD,YOU'VE SAVED"
2690 PRINT"THE GALAXY!":GOTO 2930
2700 PRINT"SULU REPORTS KLINGONS ARE DEAD!"
2710 PRINT"YOU WIN!":GOTO 2930
2720 IF L1=<50 THEN 2750:
2730 IF L2=<50 THEN 2770:
2740 GOTO 950
2750 PRINT"LT.UHURA REPORTS LIFE SUPPORT"
2760 PRINT"IS FAILING!":GOTO 950
2770 PRINT"SENSORS SHOW KLINGONS ALMOST"
2780 PRINT"OUT OF POWER!":GOTO 950
2790 PRINT"WHAT ANGLE DO YOU WANT TO "
2800 PRINT"SHOOT AT?":INPUT A:RETURN
2810 IF A<-180 THEN 2840
2820 IF Q>180THEN 2850
2830 RETURN
2840 A=A+360:GOTO 2810
2850 Q=Q-360:GOTO 2810
2860 REM:S.JONES.,APRIL,1981.
2870 REM:K RHODES.,SEPTEMBER,1981.
2880 FORT=1TO2000:NEXT
2890 INPUTFG$
2900 IFFG$="Y"THEN870
2910 IFFG$="N"THEN2930
2920 GOTO2880
2930 PRINT
2940 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
2950 PRINT"RETURN TO BASE CONTROL FOR LEAVE AND FURTHER ORDERS"
2960 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
2970 END
2980 INPUTFG$
2990 IFFG$="Y"THEN860
3000 IFFG$="N"THEN3020
3010 GOTO2930
3020 PRINT"⊐"
3030 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
3040 PRINT"RETURN TO BASE CONTROL FOR LEAVE AND     FURTHER ORDERS"
3050 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
3060 END
READY.
```

ADVERTISERS DIRECTORY

Adman Electronics	33	Newtech Publishing	22
Ashley	36	Oxford Computer Systems	72
Bytewell	67	Precision Software	53
Calco	37, 92	Romik Software	99
Dialog Software	13	Simple Software	84
DJ A1 Systems	56	SIP	18
Dynatech Microsoftware	37	Small Systems	6
Electronic Aids	84	Softex Computers	92
Facts Software	49	Solidisk Corporation	2
Galactic Software	43	Southcott Software Services	92
Greenwich Instruments	18	Startech	72
Impetus	18	Superior Systems	100
Interceptor Micros	19	Supersoft	30
Kayde	58	TAL	84
Kobra Micromarketing	45, 84	Terminal Software	67
Level 9 Computing	9	Tirith Ltd	92
Machsize	26	The Computer Room	22
Mator Systems	47	Thorn EMI	50, 51
MC2	76	Vic 20 Users Software Library	36
Mike Bignell	18	Viza Software	76
Mr Chip	81	Whitby Computers	34

---

commodore
COMPUTING
international

SUBSCRIPTION ORDER FORM

Please send me 12 issues of *Commodore Computing*

CHEQUE ENCLOSED ☐

PLEASE DEBIT MY ACCESS ☐

AMERICAN EXPRESS ☐

BARCLAYCARD ☐

CHARGE NO. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry date:

Cheques should be made payable to:
Commodore Computing

TO AVOID FUTURE LAPSE IN MY SUBSCRIPTION PLEASE DEBIT MY RENEWAL FEE TO MY CREDIT CARD ANNUALLY UNTIL I CANCEL IN WRITING.

Name..

Address..

....

County.......................... Post Code..........................

Telephone (home)..

(Business) ....

Signed..

Date (Sub to commence) ....

☐ Subscription rate U.K. £15.00
☐ Europe £20.00
☐ Outside Europe £28.50

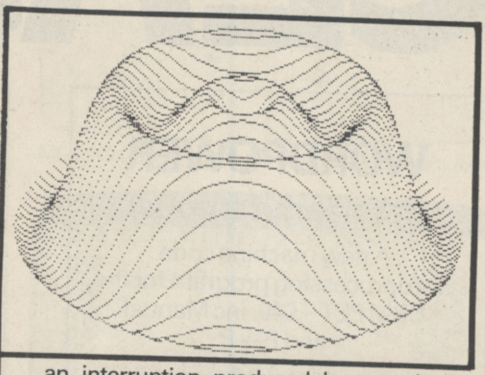
Return form to:
Subscriptions Manager,
Commodore Computing International
167-169 Great Portland Street,
London, W1

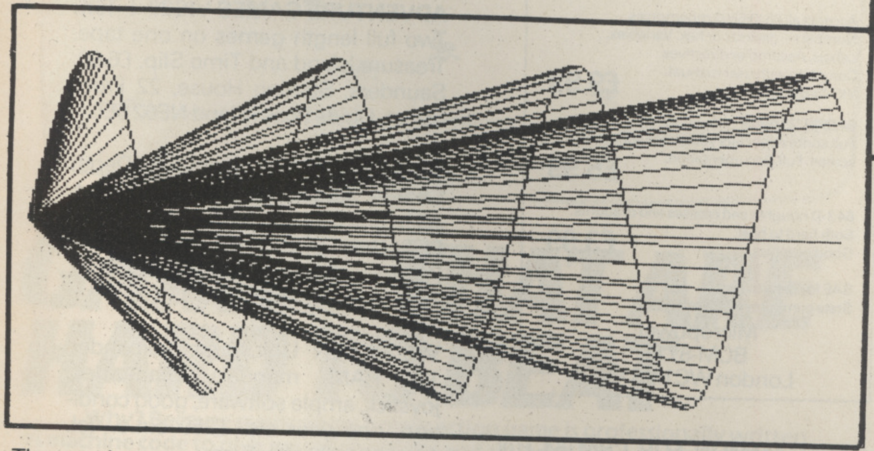
MACHINE CODE

EPSOM DUMPS *FOR THE 64*

By Luis J. Fernandez

In the June issue of Commodore Computing International a Machine Code routine to produce High Resolution Dumps for the Pet was descibed by David Hornsby. A different routine specially designed to account for the particular features of the CBM 64 is described here. It has been intended for use in conjunction with any routine that stores the high resolution graphics under the BASIC ROM, as in SG-64, a graphic tool written by Roy Wainwright. The routine is short and it occupies only 256 bytes including the area for temporary storage.





The routine starts by Saving all the status and disabling the Basic ROM. An output channel is open for the serial printer (device 4) and appropriate codes are sent to the Epsom to set up the line spacing and Bit image printing at the end of each line. Then groups of 8 bytes ('a character matrix') are picked up from the Hi-res area and converted from row patterns to column patterns which are then sent to the printer. This process is then repeated for each of the 40 characters of each line and the 25 lines of the screen. Finally the Basic ROM is reinstated, the status is retrieved and the printer is initialised before returning to the calling program. No attempt has been made to reassign the user definable keys as in other programs and the routine is simply activated by the command:

SYS 49152

The command can be issued either in immediate mode or from inside a Basic Program. Although the routine normally expects the high resolution to start at address $A000 it can easily be changed to another area of memory by pokeing appropriate values in locations $C037 (hex) and $C03A.

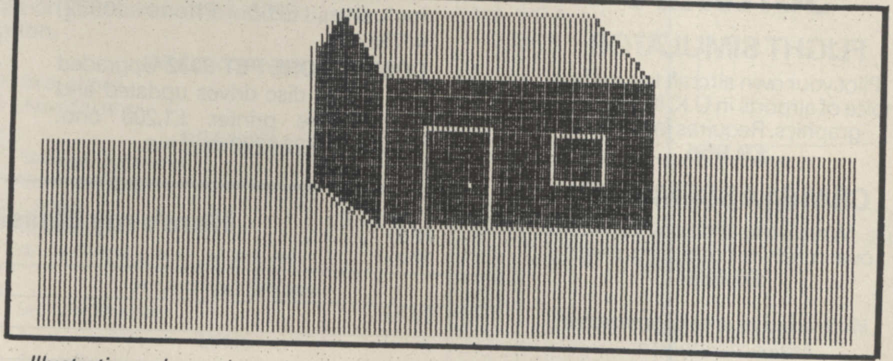
The examples shown are taken from the demonstration program supplied with SG-64. For those familiar with such examples it must be stressed that, since sprites are not within the hi-res area they cannot be dumped.

The routine is very fast indeed, and is only limited by the baud rate and the printing speed of the Epsom. It takes about 40 seconds to perform any of the dumps shown here on an EPSOM MX80 F/T 3, fitted with the RS-232 interface and the 2K byte buffer.

Finally a word of warning, since the Basic ROM is disabled during dumping an interruption produced by pressing STOP can make the 64 crash. If you run out of paper and the printer stops, insert a new sheet of paper and put the printer back on line to empty the buffers; do not try to return to Basic by pressing STOP/RESTORE!

The routine is presented here as a memory dump, if an assembly listing is desired please contact the author at:

Luis J. Fernandez
APDIP
St. George's Building
Mappin Street
The University
Sheffield S1 3JD



Illustrations above show dumps taken from the demonstration programme of Screen Graphics 64. Below is the programme for the Epsom Dumps.

```
                  0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
49152   (C000)   48 8A 48 98 48 08 A5 01 29 FE 85 01 A9 00 AA A8
49168   (C010)   20 BD FF A9 04 AA A0 FF 20 BA FF 20 C0 FF A2 04
49184   (C020)   20 C9 FF A9 1B 20 D2 FF A9 41 20 D2 FF A9 08 20
49200   (C030)   D2 FF A9 19 85 FB A9 00 85 F7 A9 A0 85 F8 A9 1B
49216   (C040)   20 D2 FF A9 4B 20 D2 FF A9 40 20 D2 FF A9 01 20
49232   (C050)   D2 FF A9 28 85 FD A5 F7 85 F9 A5 F8 85 FA A9 08
49248   (C060)   85 FC A2 00 A0 01 A1 F9 99 F0 C0 C6 FC F0 0F C8
49264   (C070)   18 A9 01 65 F9 85 F9 90 02 E6 FA 4C 66 C0 A9 08
49280   (C080)   85 FC A2 08 1E F0 C0 6E F0 C0 CA D0 F7 AD F0 C0
49296   (C090)   20 D2 FF C6 FC D0 EB 18 A9 08 65 F7 85 F7 90 02
49312   (C0A0)   E6 F8 C6 FD F0 03 4C 56 C0 A9 0D 20 D2 FF C6 FB
49328   (C0B0)   F0 03 4C 3E C0 A9 07 20 D2 FF A9 1B 20 D2 FF A9
49344   (C0C0)   40 20 D2 FF 20 CC FF A5 01 09 01 85 01 28 68 A8
49360   (C0D0)   68 AA 68 60 00 00 00 00 00 00 00 00 00 00 00 00
49376   (C0E0)   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
49392   (C0F0)   01 00 00 00 00 00 00 00 00 FF 00 00 FF FF 00 00
```

CLASSIFIED

WORDPOWER

(It's nearly famous)

A new machine code wordprocessing program for the CBM PET – £40, inc Manual and P + P

Reviewed in Commodore Computing, May '83

Send A4 SAE for further details.
(Manual Available Separately £1)

To: Mr K Pretorius,
15 The Vineries, Oakwood,
LONDON N14 4BH.

New CBM 64 Software

FLIGHT SIMULATOR

Pilot your own aircraft to a wide choice of airports in U.K. Magnificent graphics. Requires joystick.
£9.95p

CBM 64 ASSEMBLER

Write, read and copy your own machine code programs.
£6.95p

Lifetime replacement guarantee
Mail order only to:

Anger Productions:
14 The Oval, Broxbourne,
EN10 6DQ.

VIC 20 CASSETTE LEADS

Connect your VIC 20 computer to most tape recorders for only **£12.00** (allow 50p for p + p)

Gem Systems Ltd
2 Crawford Road
Hatfield
Herts AL10 0PG
Tel. 07072 74150

COMMODORE 64 VIC 20 ASSEMBLER

Accepts all 6510/6502 mnemonics.
Numbers – decimal or hex. Variables, Labels, Assembler directives.
Complete with user manual.
VIC 20-mm 16K **£9.99**

64 SPRITEDRAW
Full sprite editor lets you create sprites on screen. Full Documentation. **£5.99**

64 3-D noughts and crosses and draughts.
Both hard to beat.
Good graphics. **£3.99**

SAE for details.
State computer when ordering.

Micropower
BCM-8713
London WC1N 3XX

BACKGAMMON FOR CBM 64 Full colour game on cassette, only £5. Adrian House, 5A Murrells Lane, Camberley, Surrey GU15 29Y.

8K PET New rom plus literature and software, tool kit and supermon inclusive, £250. Phone (0632) 4173678.

COMMODORE PET 3032 Upgraded to 4.0 twin disc drives updated and Commodore printer. £1,200 ono. Phone: 01-622 0222 daytime.

CBM 4032, Cassette unit, re-set switch, toolkit, joystick, games, manuals, exc. condition. £375. Tel. (0632) 694667 5-9 pm.

ADVENTURE GAMES VIC20 + 16K. Two full length games on one tape. Treasure Island and Time Slip, £6.00. Saunders, Starling House, 22 Front Street, Guide Post, N'land NE62 5LT.

10 PET GAMES including Depth Charge, Jet Lander and Duck Shoot. All in one cassette for any 40-column PET. Only £4 from A Burton, The Paddock, Whitchurch Road, Bunbury, Tarporley, Cheshire CW6 9SX.

VIC-20 CTN Unit, super expander, 16K RAM, manuals, magazines, joystick, ample software, good condition, one year old. £250 o.n.o. Tel. 041-339 0622 after 5 pm.

VIC 20 CASSETTE GAMES Choose five from list £2.99. SAE for list. Andrew Miller, 21 Bishops Close, Totton, Southampton. Mail order only.

ATARI VIDEO GAME Brand new condition. 12 of the best cartridges: Invaders, Asteroids, etc. Cost: £350 new. Sell for £150! M. Woodley, Tel: 455-5478 (evenings).

Here's my classified ad.

Please continue on a separate sheet of paper

I make this .... words, at .... per word so I owe you £ ....

Name ....

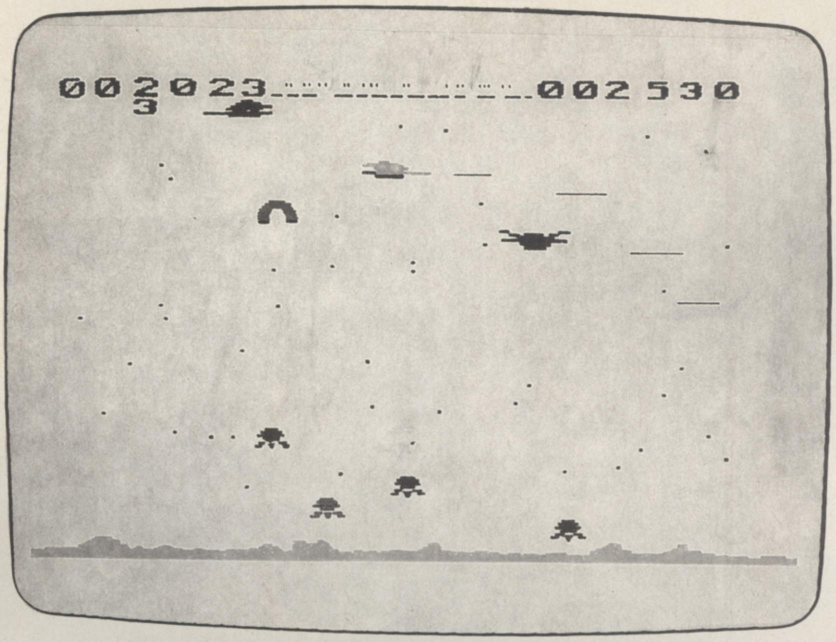
Address ....

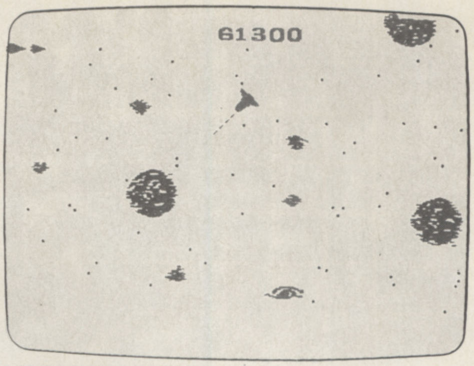
....

Telephone ....

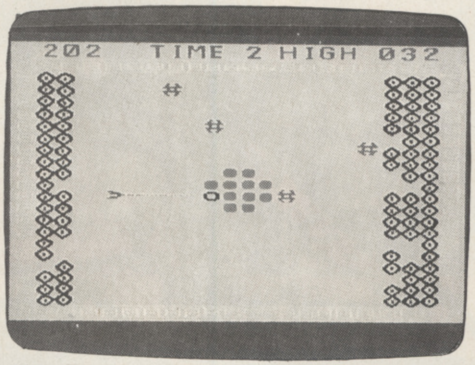
Private readers – advertisements from private readers cost 10p a word.
Trade advertisements – cost 20p a word.
Semi-display – why not make your advertisement more substantial by choosing the semi-display rate. It is only £5 a single column centimetre.

Send your classified entries to:
Classified Department,
Commodore Computing International Magazine,
167-169 Great Portland Street,
London W1N 5FD.
Tel: 01-636 6408.

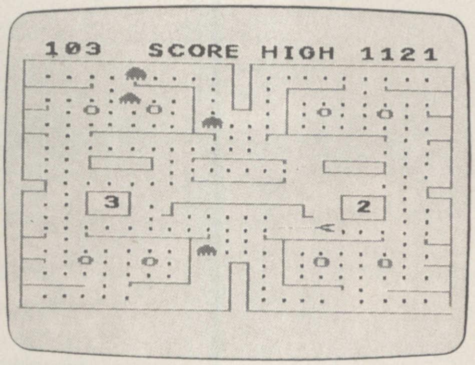




MOONS OF JUPITER for the expanded Vic 20 (any RAM)



ATOM SMASHER for the unexpanded Vic 20



POWER BLASTER for the unexpanded Vic 20

SCORE 201020 HI 230020

SPACE FORTRESS for the unexpanded Vic 20

GAMES THAT ARE HARD TO BEAT

Why? Because every single Romik action game is professionally written in machine code to give you all the thrills and action of a fast-moving arcade game. Every one recorded on top quality tape, most of them playable either from the keyboard or with joysticks.

A lot of thought and development goes into every game – and we guarantee no bugs to drive you mad, no infuriating gaps to interrupt your fun.

Whether pitted against invaders from alien worlds, tracking hungry sharks or frantically stalling the melt-down of a nuclear reactor you can be sure that if it's a Romik game you'll have a battle on your hands. The kind of battle that leaves no room for mistakes or hesitation.

UNEXPANDED VIC 20

Martian Raider	£6.99
Sea Invasion	£4.99
Power Blaster	£5.99
Space Fortress	£5.99
Shark Attack	£5.99
Atom Smasher	£6.99
Space Attack	£5.99
Mind Twisters	£4.99
Multisound Synthesiser	£6.99
Pedes and Mutants	£6.99

EXPANDED VIC 20 (3K, 8K or 16K)

Time Destroyers	£6.99
Moons of Jupiter	£7.99

NEW! ADVENTURES FOR THE VIC 20

Zorgon's Kingdom (8K or 16K) (real time graphic adventure)	£6.99
Sword of Hrakel (3K, 8K or 16K) (classic adventure)	£5.99
The Golden Apple of Zeus (8K or 16K)	£4.99

COMMODORE 64

Multisound Synthesiser	£14.99

FREE COMPETITIONS

Every action game purchased brings a free entry into the national competition to find the Supreme Champion, and free entry into the annual Romik Grand Master competition with its fantastic prizes.

BBC (Model A or B)

Birds of Prey	£6.99
Atom Smasher	£6.99

DRAGON

Strategic Command	£9.99
Convoy Attack	£9.99
Cyclops	£9.99
Romik Cube	£9.99
White Crystal (graphic adventure)	£9.99

ATARI 400 OR 800

See-Saw Scramble	£9.99

LYNX

Power Blaster	£9.99

16K or 48K SPECTRUM

Colour Clash	£7.99
Galactic Trooper	£5.99
3D Monster Chase	£6.99
Spectra Smash (plus Breakout)	£6.99
Shark Attack	£5.99

ZX 81

Super Nine – 9 1K games	£4.99
Galactic Trooper (16K)	£4.99

TOP PRICES PAID!

We're always on the lookout for new, top quality machine code arcade games for any machine. If you have what you consider a marketable game, let us know. Nobody pays higher royalties than we do.

ROMIK SOFTWARE

For further details of all our games and a list of stockists complete the coupon and send it to:
Romik Software, 272 Argyll Avenue, Slough SL1 4HE

ROMIK

Please send me further details of your games and a list of stockists.

Name____________________

Address____________________

____________________ CC 9/83

________________ Age (If under 21)________

I own a____________________ computer

SOFTWARE WITH BITE FOR commodore 64

BRANDS
Alligata

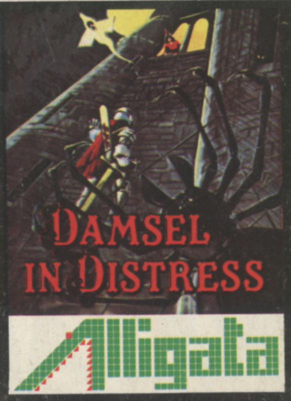
Brands £7.95

Test your skill on the Grand Prix circuit. Accelerating to breathless speeds can you overtake? Can you face the danger of night driving as the roads get narrower?

BALLOON RESCUE
Alligata

Balloon Rescue £7.95

Fuel level low. Time running out. Collect fresh fuel to stay in the air or plunge to certain agonising death.



Damsel in Distress £7.95

Menacing man-eating spiders and dreadful apparitions. Weakened by poison you must climb the battlements and rescue the princess who holds your antidote.

BAT ATTACK
Alligata

Bat Attack £7.95

Killer bats in the first wave, a myriad of asteroid discs in the second. The third wave?! … the faster your reflexes, the more deadly the challenge.

WITH FULL COLOUR GRAPHICS
AZTEC TOMB ADVENTURE
Alligata

Aztec Tomb Adventure £7.95

Find the lost tomb deep in the Amazon rain forest. Experience heart-stopping drama… will you ever get there? Every location has a full graphic picture.

SQUASH A FROG
Alligata

Squash a Frog £7.95

Cross a motorway of fast moving traffic. Traverse the rapids teeming with frog eating snakes, alligators and submerging turtles. Can you get him home? Or is it just Ugh! Splatt!

Outstanding quality, unbelievable value

Alligata presents an exciting range of games and utilities applying full machine code and high resolution, full colour graphics to the limit. Whether it's hours of absorbing fun or the hours saved through data manipulation – Alligata has been designed for you.

Order today by post or telephone!

Superior Systems Ltd., 178 West Street, Sheffield S1 4ET. Tel: (0742) 755005 VAT No. 308 5878 28.

☐ Brands ☐ Balloon Rescue ☐ Damsel in Distress ☐ Bat Attack
☐ Aztec Tomb Adventure ☐ Squash a Frog
Please debit my Access/Barclaycard (delete as necessary) allow 75p P & P
Card No: ____ Signature: ____
for £ ____ I enclose cheque/PO for £ ____
Name ____
Address ____

Despatch is normally made on receipt of order and should reach you within 7 days.

Alligata

SOFTWARE WITH BITE